

# Index

- Abbott, Scott, 101, 208  
 AC (asbestos cement) pipe, 361  
 Accuracy table, 39  
 Acreage, 28  
 ACSS (Audubon Cooperative Sanctuary System), 419  
 Administrative points (in ideal design process), 227, 228  
 Aerial photographs, 211, 282, 283, 307, 386, 387  
 Aesthetics, 32, 35  
   surface enrichment, 148–152  
   value of, 25  
   and water, 105  
 Agronomy, 108, 147  
 Alison, C. H., 4, 124  
 Alison, Hugh, 394, 395  
 All-organic golf courses, 414, 417–418  
 Ambiguity, 162–163  
 Amended soils, 347–349, 354, 365, 366  
 Americans with Disabilities Act, 127  
 American elms, 102  
 American Society of Golf Course Architects (ASGCA),  
   11, 193, 203, 259, 423  
 American Society of Golf Course Architects Code of  
   Ethics, 202  
 Ancient ways, 222  
 Angles of play, tee locations and, 129  
 Animals, grazing by, 56, 57  
 Ann Briar, 196  
 Anticipation (in recreational process), 181–183  
*The Appreciation of the Arts/Architecture* (Sinclair Gaudie),  
   155, 157, 161  
 Approach bunkers, 81  
 Approach shots:  
   green design for, 113  
   in routing rating system, 271  
   target area for, 110  
 ArborCom Technologies, 98–100  
 Archaeological sites, 215  
 “Architected” golf courses, 7  
 The Architects Club, 251  
 Army Corps of Engineers rules, 402  
 Arrival impression:  
   entrance drive, 184–186  
   parking, 185, 187  
   in recreational process, 184–190  
 Arvida Corporation, 264, 265  
 Asbestos cement (AC) pipe, 361  
 “As-built” preparation, 299  
 ASGCA, *see* American Society of Golf Course Architects
- Attitude of staff, 189, 190  
 Attractiveness, 167  
 Audubon Cooperative Sanctuary System (ACSS), 419  
 Audubon International, 410, 414, 419, 420  
 Audubon Signature program, 419  
 Augusta National, 38–40, 103, 106, 133, 204  
 Austin Country Club, 161  
 Awe (level of pleasure), 165, 167
- Bahto, George, xiii  
 Balance, 41, 169–171  
   approach shot, 271  
   between nines, 264  
   par, 264  
   of values, 429  
 Balance sheet, 208–209, 304  
 Ballesteros, Seve, 94  
 Banff Springs Golf Course, 86, 126  
 Banks, fertilization of, 377  
 Barclay, James A., xiii  
 Barrett, James, 364  
 Base maps, 222, 286, 388  
   annotations on, 280, 281  
   for improvements, 386–388  
   scale of, 307, 311  
   sheets in, 307, 310–316  
   site/construction data on, 311  
 Base sheets, 307, 310–316  
 Bauer, Aleck, 152  
 Beauty:  
   perceptions of, 153. *See also* Visual messages  
   and proportional relationship of elements, 169  
   sources of, 160–162  
 Belair Country Club, 273  
 Bell, William P., 4, 5, 193  
 Bell and spigot PVC pipe, 362  
 Bendelow, Tom, 3  
 Bent grass, 69, 70  
 Bermuda grass, 69  
 Bid bonds, 319, 320  
 Bidding, 23, 319  
   bid documents, 290, 318  
   prebid site inspections, 318  
 Bid documents, 290, 318  
 Biodiversity, 410, 413  
 Biologically friendly products, 418  
 Biostimulants, 378  
 Blacklick Woods Golf Course (Columbus, Ohio),  
   387–389, 391

- Black sand, 86  
 Black steel pipe, 361  
 Black tees, 37  
 Blackthorn (South Bend, Indiana), 333  
 Blind areas, 18, 29–31  
 Blind golf holes, 77, 78  
 Blue, John D., 424  
 Bluegrass, 107, 108  
 Blue tees, 37  
 Bonds, 320  
 Boulders, 91, 93  
 Bounce bunkers, 95  
 Bounce of golf balls:  
     and rock hazards, 89  
     and use of mounds, 73  
 “Break,” 67  
 Bridges, 334–336  
 The British and International Golf Greenkeepers  
     Association, 414  
 British Ladies’ Championship, 384  
 British Open courses, 73  
 Budgets, 208, 209, 284, 301, 332  
 Buffers, 26, 28, 105, 129  
 Buffer zones, 403  
 Building golf courses, 4–6. *See also* Construction  
*Building the Practical Golf Facility* (Michael J. Hurdzan), 209  
 Bulldozers, 6, 329, 331  
 Bully Pulpit (Medora, North Dakota), 19, 86  
 Bunkers, 46–48, 80–87  
     approach, 81  
     bounce, 95  
     complementary shapes for, 176  
     evolving forms of, 158, 160  
     fairway, 80, 81, 83, 170  
     and form of green, 111  
     functions of, 86, 87  
     grade stakes for, 342, 343  
     greenside, 82, 84, 85  
     in middle of fairways, 170  
     planting, 368  
     road hole, 51  
     sand for, 179  
     shadow, 332  
     shape of, 175  
     and shot value of hole, 150  
     sod wall, 82, 94, 95  
     surface enrichment of, 150, 151  
     surface texture of, 85  
     as symbols, 157, 158, 160  
     waste areas vs., 80  
 Buried utilities, 222  
 Bushes, 149  
 Business of golf:  
     architect’s understanding of, 199  
     exposing players to, 184  
 Caddies (in Japan), 184  
 Calendar, construction, 320–321  
 California Method:  
     for green construction, 71, 345–347  
     for subsurface green construction, 111  
 Calusa Pines Golf Club (Naples, Florida), 48, 85, 86, 175  
 Cardinal Bunker (Prestwick, Scotland), 47  
 The Cardinal hole (Prestwick), 167, 177  
 Carnoustie, 40  
 Cartography, 282. *See also* Mapping  
 CDES, *see* Conservation Development Evaluation System  
 CDs, *see* Construction documents  
 Celebration (Orlando, Florida), 37  
 Celebrity-designed golf courses, 12–13, 400–401  
 Center for Resource Management (CRM), 416, 419, 421  
 Chain of command, 338  
 Change orders, 23, 338–340  
 Chipping areas, 146  
 Citadel (San Angelo, Texas), 324  
 Clearing, 324–325  
 Climatology of sites, 212  
 Clubhouses, 192  
     potential sites for, 222, 284  
     relationship of golf holes and, 272  
 Cobblestone Creek, 117, 129  
 Coeur d’Alene (Idaho), 35  
 Colt, Harry S., 51, 124  
 Committed to Green program, 414, 415  
 Common land, 222  
 Communication:  
     in chain of command, 338  
     as essential skill, 193–196  
     by form of elements, 173–176  
     golf course architects’ skills in, 193–196  
     by materials, 172–173  
     roster of parties for, 323  
     by size of elements, 172  
     by symmetry/imbalance, 170  
     visual, 154. *See also* Visual messages  
 Compaction, 351  
 Complementary shapes, 175–176  
 Composite grading plans, 313  
 Compromises, 256–258  
 Computer technology, xi, 277–300  
     for “as-builts” preparation, 299  
     and construction documents, 290–297  
     in design development, 285–287  
     design software, 300  
     in golf course design, 277–279  
     for irrigation systems, 363  
     for language conversion, 297–299  
     mapping, 280–284  
     as marketing tool, 299–300  
     and permitting process, 288–289  
     proper integration of, 277–279  
     for rendering plans, 289–290  
     in schematic design, 284–285  
 Concept drawings, 390  
 Confusion, 162–163  
 Coniferous trees, 102  
 Connoisseurship, 155  
 Conservation Development Evaluation System (CDES),  
     408, 410  
 The Conservation Fund (TCF), 408, 410  
 Consistency of design, 179, 250  
 Constraints maps, 209–211, 282–284

- Constraints on design, 253–254
- Construction:
- architect's understanding of techniques for, 199–200
  - cost estimation for, 147, 149
  - early methods of, 6
  - of greens, 342–356
  - planning for, 42, 44
  - of sand traps, 356
  - sequence for, *see* Construction sequence
  - of subsurface green, 111
  - of tees, 341–342, 356
- Construction calendar, 320–321
- Construction documents (CDs):
- accuracy of, 201
  - architect's understanding of, 199–200
  - by architects vs. outside consultants, 198
  - base sheets, 307, 310–316
  - bid documents, 318
  - computer technology for, 290–297
  - construction calendar, 320–321
  - contract, 319–320
  - detailed drawings, 311, 317
  - detailed specifications, 317–318
  - in evolving design process, 276
  - grading plans, 290
  - in ideal design process, 236–239
  - initiation of, 141–146
  - intent of, 290, 317
  - master plan, 235–236, 274–276
  - preparation of, 290–297
  - purpose of, 317
  - specifications, 317
- Construction sequence, 323–340
- clearing and grubbing, 324–325
  - earthmoving, 327–331
  - evolving nature of, 336–337
  - major drainage, 327, 328
  - preconstruction considerations, 323
  - and professional relationships, 338–340
  - and role of golf course superintendent, 334
  - selective thinning, 325–327
  - shaping, 331–334
  - staking, 323, 324
  - walls and bridges, 334–336
- Containment golf holes, 33, 42, 43
- Contingency funds, 301
- Contours:
- of design subgrade, 349, 351
  - and maintenance of fairways, 134–135
  - and roll of ball, 67
- Contour mowing, 58, 63, 65
- for fairgreens, 134
  - for reinforcing form, 176
- Contour planting, 56, 134
- Contour Services, Inc., 299
- Contract, division of, 319–320
- Contractors:
- bid notices for, 319
  - precontract meeting with, 321–322
  - relationships with, 201, 203, 338–340
- Control systems, irrigation, 363
- Cook, Cathy, 74
- Cook, John, 73, 74, 105, 106
- Cook's Creek (Circleville, Ohio), 33, 73, 74, 100, 105, 106, 179, 305, 331, 332, 366, 367, 370, 385
- Cooldown phase (in recreational process), 192
- Coore, Bill, 18
- "Cop" bunkers, 47
- Cornish, Geoffrey, xiii
- Corridor width, 260, 269
- Cosmetic enhancement of holes, 148–152
- Costa, Virginia, 299
- Costs:
- financing for, 303–304
  - maintenance, 216
  - of playing golf, 209
  - reducing, 304–306
- Cost estimates:
- based on schematic design, 273
  - for construction, 147, 149
  - timing of, 283, 284
- The Countryside Commission, 414
- CRM, *see* Center for Resource Management
- Crossing holds, 4
- Crump, George, 17
- Cultural symbols, 154–155
- Cup settings, turfgrass healing and, 108–110
- Cutting height, 62
- Cypress Point (Monterey Peninsula), xiii, 40, 86, 87, 166, 167, 172, 184, 198, 219, 224, 229, 399
- Daray, Jack, 193
- Darwin, Bernard, 65
- Darwin, Charles, 107
- Data collection, GPS, 281
- Daylar Group, 254–256
- Deadlines, 323
- Decorative plantings, 102, 103
- Deep rough, 55
- Deflection of balls, 88
- Delight (level of pleasure), 165
- "The Dell" (Lahinch), 77
- Del Safari Golf Course (Palm Desert), 107
- Depressions, 78–79
- and design styles, 138–139
  - in freeway design, 144
  - in heroic design, 141, 143
  - in penal design, 141
  - in strategic design, 141, 144–146
- Desert Willow Firecliff, 136
- Design details, 124, 196, 197
- Design development:
- computer technology in, 285–287
  - in evolving design process, 273–274
  - goal of, 234
  - in ideal design process, 232, 234
  - for individual holes, 139–141
- Design expression, limitations to, 253–254
- Design finish grade, 328
- Design intent, 196

- Design of golf courses, 3. *See also specific topics*  
 computer technology in, 277–279  
 environmental, 423–424  
 evolving process of, *see* Evolving design process  
 goals in, 155, 222  
 hazards, 51, 53  
 ideal process for, *see* Ideal design process  
 importance of maintenance vs., 191  
 making changes in, 147, 149  
 peer review in, 284  
 philosophies of, 18–22  
 team approach to, 254  
 for water management, 410–414
- Design philosophy, 250–253
- Design subgrade, 328, 349–351
- Design team, 254
- Detailed Construction Specifications and Standards of Workmanship, 276
- Detailed drawings, 311, 317
- Detailed specifications, 317–318
- Development factors (in routing rating system), 272, 273
- Devil's Paintbrush (Caledon, Ontario), 18, 49, 75, 76, 78, 83, 91, 94–96, 171, 172, 180, 196, 217, 290, 331, 334, 336
- Devil's Pulpit (Caledon, Ontario), 100, 101, 177, 185–190, 196, 208, 215, 262
- Diddle, William, 193
- Direction of holes, 271
- Discovering Donald Ross* (Brad Klein), xiii, 195
- Disequilibrium, 170
- Disorder, 163
- Distances, 42  
 determining, 167–168  
 from green to tee, 272  
 for travel to golf courses, 183
- Division of contract, 319–320
- Doak, Tom, 18
- Dobson, Robert, 364
- Donald Ross Society, 392
- Dornoch, 171, 229
- Drainage, 9  
 analyzing patterns of, 219–220  
 and construction method, 347  
 in construction sequence, 327, 328  
 of fairways, 129, 132  
 on grading and drainage plan, 312  
 for greens, 117, 350  
 planning, 234–235  
 and shaping, 334  
 for tees, 341  
 tile, 111, 351–352
- Drawings. *See also* Construction documents; Schematic design  
 architect's understanding of, 199–200  
 concept vs. working, 390  
 stick and ball, 222  
 working, 307
- Drawing of record, 360
- Dredges, 330
- Dripline, 100
- Drive length, average statistics for, 103
- Dundarave (Prince Edward Island, Canada), 168
- Dye, Pete, 17, 21, 114, 161, 253
- Eagles' Landing (Ocean City, Maryland), 52, 164
- EagleSticks (Zanesville, Ohio), 131, 183, 384
- Earthmovers, 329, 330
- Earthmoving equipment, 6, 328
- Earthmoving plan, 313
- Earthwork:  
 in construction sequence, 327–331  
 early software packages for, 278  
 estimating costs of, 147  
 in green construction, 343–345  
 in ideal design process, 229–230  
 naturalness of, 173, 174
- Earthwork camouflage, 21
- Easements, 222
- Economics of course construction, 208–209, 301–306
- Edinburgh College of Art and Design, 8
- Effluent water, 213, 359
- EIFG, *see* Environmental Institute for Golf
- Electronic file transfers, 258, 287
- Electrostatic plotters, 296
- Elevation, driving distances and, 37
- Elevator pan, 330
- Emotional associations, 157
- English Golf Union, 414
- Entrance drive, 184–186
- An Environmental Approach to Golf Course Development* (Bill Love), 423
- Environmental Institute for Golf (EIFG), 419, 421–423
- Environmental issues, 397–430  
 all-organic golf courses, 414, 417–418  
 balancing economic and social community values with, 429  
 case study, 424–427  
 and false images of golf courses, 397–399  
 measuring impact of golf, 429  
 on-site water management, 408–416  
 organizations involved with golf and, 419–423  
 and permit process, 279  
 scientific research on, 418–419  
 Smart Growth, 403–416  
 in team approach, 258–259  
 urban sprawl, 399–403
- Environmental resource areas, identifying, 220–221
- Erosion, 47, 372
- Ethics, 201–203
- European golf:  
 and bunkers in middle of fairways, 170  
 sod wall bunkers in, 82
- European Golf Association Ecology Unit, 414, 415
- European-type linksland golf courses, 78
- The Evangelist of Golf* (George Bahto), xiii
- The Evolution of a Legacy*, 60
- Evolving design process, 249–276  
 construction documents, 276  
 design development phase, 273–274  
 design dilemmas in, 250–253

- limitations to design expression, 253–254  
 master plan, 274–276  
 permit process, 276  
 rating system for routings, 264–273  
 routing the course, 259–263  
 “signature” holes, 249–250  
 team approach to design, 254–259  
 Executive courses, 303–304  
 Experiences, perceptions of, *see* Recreational process of golf  
 Explosives, 6, 7  
 Extravagantism, 18, 20  
 Extravagant minimalism, 21  
  
 Failure, reasons for, 209  
 Fairgreens, 3, 56, 132–134  
 Fairness of course, 37–38  
 Fairways, 3  
 drainage of, 129, 132  
   drains in, 334  
   fertilization of, 377  
   form/function of, 129, 131–136  
   grasses for, 62  
   integration of roughs and, 132–134  
   maintenance of, 129, 130, 134–136  
   mounds in, 75, 76  
   planting, 368  
   surface enrichment of, 151  
   and trees, 60, 61  
 Fairway bunkers, 80, 81, 83, 170  
 Familiarity (level of pleasure), 165  
 Fawcett, Farrah, 273  
 Fazio, George, 60  
 Fazio, Tom, 17, 18, 60  
 Fear, awe vs., 165, 167  
 Feasibility study, 207. *See also* Site analysis and feasibility study  
 Features:  
   improvements analysis of, 386  
   shaping, 331–334  
   water, 412–414  
 Feature plans, 309, 310  
 Fencing, 184  
 Fertilization, 377  
   preplanting, 368  
   winter, 377  
   of young turf, 376  
 Field checking, 235  
 Fieldstone Golf Club (Wilmington, Delaware), 18, 19, 95  
 File transfer point (FTP), 258, 287, 297  
 Fill materials, 105  
 Final grading, 366, 367  
 Financing, 301, 303  
 Fine-bladed Bermuda grasses, 69, 70  
 Firestone South Course (Akron, Ohio), 224  
 First impressions of courses, *see* Arrival impression  
 Flexibility:  
   for playing quality, 36, 37  
   and tee form/function, 126  
 Floating greens, 34, 35  
  
 Flow, 41–42  
   of forces, 179–180  
   handicap, 271  
 Flowering trees, 102, 149  
 Flowers:  
   for surface enrichment, 149, 151  
   in visual message, 177  
 Flynn, William, 7  
 Force of objects, 179–180  
 Fore Hope (Columbus, Ohio), 408  
 Form, 172–176  
 “Form follows function,” 107  
   for fairways, 129, 131–136  
   for green complexes, 108, 113  
   for tees, 126  
 Fornes, H. C., 17  
 Foundations (as hazards), 94, 95  
 Frames of reference, 168  
 Free-form features, 174, 175  
 Free-form multiple-level tees, 125, 174  
 Freeway design, 53–54  
   depressions/mounds in, 144  
   hazards in, 138, 139, 144  
   of individual holes, 140  
 Freeway holes, 21, 24  
 Friendly rough, 63  
 Frost, A. B., 47, 184  
 Frost line, 354  
 Fruit trees, 149  
 Fry, Dana, 14, 74, 196, 337  
 FTP, *see* File transfer point  
*The Future of Golf in America* (Geoff Shackelford), xiii  
  
 Galvanized pipe, 361  
 Game of golf:  
   architect’s relationship to, 203–204  
   changes in, 381  
   knowledge of, 199  
   measuring impact of, 429  
   perceptions of, 427  
   in recreational process, 190–192  
 Gauldie, Sinclair, 155, 157, 161–163  
 GCSA, *see* Golf Course Superintendents Association of America  
 Gender separation, 48  
 General Conditions, 276  
 General conditions, 317  
 Geographic Information System (GIS), 31, 280, 281, 299, 300  
 Georgian Bay Club, 299–300  
 Germination factors (turfgrasses), 372, 373  
   light, 373–375  
   moisture, 375–376  
   nutrition, 376–378  
   temperature, 373  
 GIS, *see* Geographic Information System  
 GlenEagles (Scotland), 76, 159  
 Glenmaura National (Moosic, Pennsylvania), 88, 89, 92, 114, 115, 162, 164, 171, 196, 334, 371, 432  
 Global Positioning System (GPS), 31, 280, 281, 299, 300

- Goals:  
 of design development, 234  
 project, 222
- Gold tees, 37
- Golf and Environment Initiative, 416, 419
- Golf balls, evolution of, 26
- Golf cars, 41, 42
- The Golf Club (Columbus, Ohio), 253
- Golf Club (Dublin, Ohio), 261
- Golf courses:  
 all-organic, 414, 417–418  
 false images of, 397–399  
 Smart Growth, 405–408  
 as symbols, 160
- Golf course architects, 193–204
- communication skills of, 193–196  
 drawings/documents produced by, 197–199  
 education/training for, 201  
 ethics of, 201–203  
 evaluating skill of, 194–196  
 knowledge of golf game by, 199  
 maps/drawings/construction skills of, 199–200  
 master, 4  
 professional skills of, 201  
 relationships with superintendents/contractors,  
 338–340  
 and relationship to game of golf, 203–204  
 seedbed preparation approval from, 366–368  
 selection of, 385  
 standard notation used by, 196, 197  
 understanding of golf course business by, 199  
 visual, 22–23
- Golf course architecture, 3–24  
 aesthetics in, 32, 35  
 balance in, 41  
 “building” a golf course concept, 6  
 and categorization of holes, 23–24  
 and construction planning, 42, 44  
 contemporary, 6–7  
 definition of, 24  
 design philosophies for, 18–22  
 as distinct discipline, 8–10  
 fairness in, 37–38  
 flexibility in, 36, 37  
 flow in, 41–42  
 indemnification in, 28  
 and long-term maintenance, 42, 43  
 methods of practice, 17–18  
 professional training for, 10–17  
 progression in, 40–41  
 risk management in, 28–29  
 safety considerations in, 25–32  
 sequential process of, 8  
 shifting priorities in, 25  
 and shot value, 38–40  
 teaching of, 108  
 and tournament qualities of courses, 34, 35, 37  
 visual aspects of, 22–23
- Golf Course Builders Association of America, 13
- Golf Course Design* (Geoffrey Cornish and Robert Muir  
 Graves), xii, xiii
- Golf Course Irrigation* (James Barrett, Brian Vinchesi,  
 Robert Dobson, Paul Roche, and David Zoldoske),  
 364
- Golf course superintendent:  
 in chain of command, 338  
 in construction planning, 44  
 and construction sequence, 334  
 hiring of, 336, 337  
 and improvement work, 390, 392  
 relationships with architects/contractors, 338–340  
 role of, 337, 338
- Golf Course Superintendents Association of America  
 (GCSA), 337, 421–422
- Golf equipment, xi, 32
- Golf Greens* (Michael J. Hurdzan), 111, 342, 356
- Golf Illustrated* (1917), 126
- Golfing experience, *see* Game of golf; Recreational  
 process of golf
- Golf Is My Game* (Bobby Jones), 204
- Golf shoe spikes, xi
- Gordon, William F., 193
- Gorse, 64, 65, 97
- GPS, *see* Global Positioning System
- Grade stakes, 327, 328, 342, 343, 345
- Grading, 8–9, 328  
 of amended soil, 354  
 of fairways, 129  
 final, 366, 367  
 in green construction, 343–345  
 skill required for, 354, 355
- Grading and drainage plan, 312
- Grading plans, 290, 311, 313
- Grand Valley State University, 302
- Grant, Douglas, 17
- Grasses, 55–56. *See also* Turfgrasses  
 consistent use of, 179  
 cutting heights for, 62  
 growth stages of, 371, 372  
 and Hurdzan/Fry grassing philosophy, 62  
 improved varieties of, 407  
 native, 64  
 for rough, 60, 62  
 and slopes/speed of greens, 69  
 for surface enrichment, 149  
 in visual message, 177, 179
- Grassing plans, 316
- Grass traps, 79–80
- Graves, Robert Muir, xiii
- Graveyards, 215
- Great Britain, trees on golf courses in, 97
- Great Depression, 54
- Greens:  
 on detailed drawings, 311  
 floating, 34, 35  
 grasses for control on, 69  
 mowing of, 378  
 mulch removal from, 375  
 planting, 368  
 selecting sites for, 235  
 sizing of, 224  
 slopes of, 67–72

- Green complexes, 85, 107–124  
 design strategy for, 113–124  
 form/function of, 107–108, 113  
 golfing vs. agronomic criteria for, 113  
 integration of forms in, 176  
 overall theory of design for, 110, 111  
 slope/size of, 108–113  
 stresses on, 107, 108
- Green construction, 342–356  
 amended soils, 354  
 approval of design subgrade, 349–351  
 grading, 343–345  
 irrigation, 352–355  
 and long-term maintenance, 70–72  
 methods for, 345–349  
 staking, 342–343  
 tile drainage, 351
- Greenside bunkers, 82, 84, 85
- Green speeds, xi
- Grounds for Golf* (Geoff Shackelford), xiii
- Grow-in, 370, 380
- Growth enhancers, 378
- Grubbing, 324–325
- Guardian trees, 100
- Hagadone, Duane, 35
- Hamilton Farm (Bedminster, New Jersey), 169, 170, 254–257
- Handicap flow, 271
- Haney, Chris, 101, 200, 208
- Hanse, Gil, 18
- Harmony, 175–176
- Harris, Robert Bruce, 7, 193
- Hawktree (North Dakota), 86
- Hay, *see* Roughs
- Hazards, 45–106  
 bunkers, 80–87  
 and competitive hole placement, 117  
 defining target areas with, 115  
 depressions, 78–79  
 environmental factors as, 106  
 in freeway design, 53–54, 138, 139, 144  
 grass traps, 79–80  
 in heroic design, 52, 53, 138–139  
 and individual hole design, 137  
 man-made structures as, 93–96  
 mounds, 72–78  
 out-of-bounds, 105  
 in penal design, 50, 51, 138  
 philosophy of, 48, 50  
 rocks/boulders/stones, 88–93  
 rough, 55–65  
 and site-specific factors, 46  
 slopes as, 65–72  
 in strategic design, 51, 53, 138, 139  
 and tee location, 129  
 trees, 97–103  
 types of, 45  
 variations in, 46–49  
 visibility of, 224  
 water, 103–106
- Hazards* (Aleck Bauer), 152
- Hell Bunker (Old Course at St. Andrews), 45, 83
- Heroic design, 52, 53, 91  
 depressions/mounds in, 141, 143  
 hazards in, 138–139  
 of individual holes, 139–140
- Heroic holes, 21, 24, 37, 38
- Hickory Course (Hamilton Farm), 256
- Hickory Hills Golf Club (Grove City, Ohio), 304
- “Hiding” technique, 77, 78
- Highland Course (Hamilton Farm), 258
- Highland Links Course (Cape Cod National Seashore), 428
- Hillcrest Country Club (Batesville, Indiana), 95, 343, 344
- Historical sites, 215, 222
- Holes, 3, 137–152  
 balance between nines, 264  
 blind, 77, 78  
 change in direction of, 271  
 changing locations of, 108, 109  
 competitive hole placement, 114, 117  
 construction document phase initiation for, 141–146  
 construction factors influencing, 147  
 containment, 33  
 corridor width for, 260, 269  
 cost estimates for construction of, 147, 149  
 crossing, 4  
 design development phase for, 139–141  
 design theories for, 21  
 diversity in length of, 224  
 and factors influencing greens, 147  
 ideal design process for, 227–233  
 location of, 39  
 par balance by, 264  
 relationship of clubhouse and, 272  
 rules of thumb for, 224  
 safety guidelines for, 260–261  
 schematic design phase for, 138–139  
 “signature,” 249–250  
 starting, 222  
 strategic positions for, 117  
 surface enrichment for, 148–152
- Hook side:  
 out-of-bounds hazards on, 105  
 water hazards on, 103, 104
- Horizontal rhythm, 171
- Horse-drawn mowers, 56, 57, 132
- Human relations (in recreational process), 188–190
- Hurdzan, Michael J., 14, 74, 111, 209, 337, 342, 356, 392
- Hurdzan design guidelines, 27
- Hurdzan/Fry, 14, 255, 257, 278
- Hvizcak, Rick, 91
- Hydroseeders, 375
- Ideal design process, 217–247  
 construction document phase, 236–239  
 design development, 232, 234  
 drainage pattern analysis, 219–220  
 drainage planning, 234–235  
 earthmoving, 229–230

- Ideal design process (*cont'd*)
- establishing administrative points, 227, 228
  - establishing design goals, 222
  - example of, 224–247
  - existing water courses, 221–222
  - field checking, 235
  - fitting in holes, 227–233
  - identifying environmental resource areas, 220–221
  - master plan, 235–236
  - rules of thumb in, 222, 224
  - schematic design, 222
  - schematic designs review, 232
  - selecting green site, 235
  - “sensing” sites, 217–219
  - soil profiles, 221
  - special features of sites, 222, 223
  - vegetation evaluation, 221
- Impact areas, 224
- Improved method (subsurface green construction), 111
- Improvements, 381–395
- agronomic, 108
  - analyzing course features for, 386
  - base maps for, 386–388
  - committee for, 385–386, 390
  - completing study of, 390, 391
  - concept vs. working drawings for, 390
  - example of, 394–395
  - explaining study of, 390
  - proper planning for, 381
  - reasons for, 381–385
  - and restoration, 392–394
  - role of superintendent in planning, 390, 392
  - selecting architect for, 385
  - unproductive, 381
- Improvement committee, 385–386, 390
- Improvement study, 390, 391
- Indemnification, 28
- Instructions to bidders, 317
- Instructions to Bidders and Forms, 276
- Integrated pest management (IPM), 405, 406
- Intermediate rough, 63
- Invert elevations, 327, 328
- IPM, *see* Integrated pest management
- Irish Links Style, 78
- Ironhorse Golf Course (Leawood, Kansas), 185, 224–247, 309, 353
- I Roveri Golf Club, 309
- Irrigation, 58, 70, 105, 357–364
- control systems, 363
  - drawing of record for, 360
  - and green construction, 352–355
  - head locations, 352, 360–361
  - head/swing joint backfill, 354
  - improvements in, 383
  - laying out work, 357
  - materials used in, 361
  - pump station installation, 359–360
  - pump station selection, 357–358
  - PVC pipe for, 361, 362
  - to roughs, 62
  - of seed beds, 369, 375–376
  - sprinkler patterns, 352–354
  - swing joints, 362–363
  - and tee construction, 341
  - trenches for, 354
  - water saving devices, 363
  - water sources, 212–213, 358, 359
- Irrigation fairways, 58
- Irrigation maps, 386
- Irrigation plans, 315
- Japan:
- golf customs/courtesies in, 184
  - human relations attitudes in, 189, 190
  - terrain of courses in, 66
  - travel to golf experience in, 183
- Jargon, 195
- Jericho National (New Hope, Pennsylvania), 191
- Jones, Fred, 253
- Jones, Robert Trent, 7, 74, 193, 247, 250
- Jones, Robert Trent, Sr., 60
- Jones, Robert Tyre (Bobby), Jr., xiii, 204
- Juniors’ tees, 127
- Kay, Stephen, 251
- Keller, Don, 289, 290
- Kemp, Geoff, 337
- Kerman, Bill, 14, 264, 325
- Kidwell, Jack, 327, 374
- Kinslow, Scott, 294
- Klein, Brad, xiii, 195
- Kohler, Herb, 21
- Labor-saving devices, 54, 127
- Lahinch, 76–77
- Laid-out golf courses, 3–5
- Land:
- leased, 304–305
  - purchase of, 303, 305
- Landing areas, 37, 39, 42, 43
- for average male players, 65
  - and competitive hole placement, 117
  - and length of approach shot, 113, 117
  - visibility of, 224
- “Landing strip” tees, 168
- Landscaping, 148–152
- Langford, W. B., 193
- Langford, William, 7
- Language conversion, by computer, 297–299
- Lawrence, Robert F. “Red,” 193
- Learning centers, 222, 224, 407
- Leased land, 304–305
- The Ledges (Huntsville Mountain, Alabama), 89, 90, 424–427
- Legal issues:
- professional relationships, 338–340
  - in site assessment, 215
  - understanding of, 199
- Length:
- for executive courses, 303–304
  - in routing rating system, 264
- Light, turfgrass growth and, 373–375

- Limit of activity, slope and, 66  
 Linear tees, 125  
 Line of sight, 30, 31  
 Linksland golf, 97, 158, 159  
 Links Trust, 51  
 Lobbyists, 257, 258  
 Location maps, 307  
 Locust trees, 102  
 Logos, 155  
 "The look," 170, 171  
 Love, Bill, 423  
 Low-cost golf courses, 209  
 Low-volume sprinkler heads, 363  
 Lucent Corporation, 254–256
- Macdonald, C. B., xiii, 4, 6, 52, 74, 75, 252, 253  
 McGovern, J. B., 4, 193  
 MacKenzie, Alister, 5, 21, 68, 86, 87, 105, 124, 153, 167, 197–199, 204, 219  
 MacKenzie Society, 392  
 Maintenance, 9, 10
  - by animal grazing, 56, 57
  - cost assessments for, 216
  - of fairways, 129, 130, 134–136
  - and green construction, 70–72
  - importance of design vs., 191
  - long-term, 42, 43, 70–72
  - in poor economic times, 54–55
  - and slope, 65
  - for spring start-up, 380
  - of tees, 127
- Maintenance bonds, 320  
 Man-made structures (as hazards), 93–96  
 Maps, 211
  - architect's understanding of, 199–200
  - base, 222, 307, 310–316, 388. *See also* Base maps
  - comprehensive, 223
  - constraints, 209–211, 282–284
  - irrigation, 386
  - location, 307
  - metric, 307
  - opportunity, 282–284
  - property line, 386
  - of rights-of-way, 386
  - site, 225
  - topographic, 386
  - utilities, 386
- Mapping, 280–284
  - accuracy of, 281–282
  - computer technology in, 280–284
  - permit requirements for, 281
  - resource, 214
  - in site assessment, 209–211
  - in team approach, 258
  - vegetation, 214
- Margins of error, 48  
 Market for golf courses, 183  
 Marketing tool, computer technology as, 299–300  
 Master golf architects, 4  
 Master plan:
  - computer-rendered, 289
  - in evolving design process, 274–276
  - in ideal design process, 235–236
- Materials:
  - consistent use of, 179
  - as indicator of meaning, 172–173
  - in irrigation systems, 361
  - in visual message, 176–179
- Maturation (turfgrass), 378–380  
 Maxwell, Perry, 193, 198  
 Meadow Links (Hamilton County, Ohio), 303  
 Meetings:
  - preconstruction, 323
  - precontract, 321–322
  - presubmittal, 287, 288
- Men's tees, 37, 127  
 Mentoring, 15, 16  
 Method of payment, 320  
 Metric maps, 307  
 Microclimates, 212  
 Micronutrients, 377–379  
 Middle tees, 127  
 Mid Ocean, 52  
 Militia Hills Golf Course (Philadelphia), 283  
 Minimalism, 18, 19  
 Monstrous elements, 163, 168  
 Morris, Old Tom, 3, 51, 224  
 Morris County (New Jersey), 47  
 Mounds, 32, 33, 65, 66, 72–78
  - depressions vs., 78–79
  - and form of green, 111
  - in freeway design, 144
  - grade stakes for, 342, 343
  - in heroic design, 141, 143
  - obscuring of golfer's view by, 76, 77
  - in penal design, 141
  - purposes of, 73
  - and shot value, 75
  - slopes of, 72
  - slopes vs., 72, 73
  - in strategic design, 141, 144–146
  - at tees, 129
- Mountain View (Palm Desert), 178  
 Mowers, 56, 57
  - fairway, 132
  - horse-drawn, 132
  - improvements in, 382
- Mowing, 56–58
  - contour, 58, 63, 65, 176
  - of newly planted areas, 378, 379
  - patterns of, 60, 62, 63
  - practices for, 55
- Muirfield, 76, 77, 177  
 Mulches, 65, 368, 369
  - applying, 373–375
  - carbon nitrogen ratio of, 377
- Multiple tees, 48
- Naples National Golf Club (Florida), 91, 134, 135, 171, 172, 174, 219, 333, 334, 336  
 National Association of Home Builders, 404  
 National Audubon Society, 400, 411, 419

- National Golf Links (Long Island), 6, 74, 75, 252, 253  
 National Mapping Program Standards, 282  
 Native grasses, 64, 151  
 Native materials, 86, 151  
 Naturalness of form, 173–174  
 Natural Resources Management Plan (NRMP), 419  
 Natural selection, 107, 108  
 Neville, Jack, 17  
 Nines, balance between, 264  
 Nine-gang mowers, 54  
 Nonturf vegetation, 64, 65  
 North American golf:  
   and bunkers in middle of fairways, 170  
   consistent use of materials in, 179  
   fairway bunkers in, 81  
   greenside bunkers in, 82  
   water use by, 397, 398  
 North Berwick, 74, 75, 177  
 NRMP (Natural Resources Management Plan), 419
- Oak Hill (Rochester, New York), 60, 61  
 Oakmont, 17, 46, 129  
 Oak trees, 102  
 Objectives, project, 222  
 Ohio State University golf courses, 197–198  
 Ohio State University Scarlet Golf Course, 68–70, 394  
 Old Course at St. Andrews, 40, 45, 51, 78, 79, 83, 93, 94, 157, 171, 249  
 Olde Stonewall (Ellwood City, Pennsylvania), 92  
 Old Works (Montana), 86  
 Olmsted, Frederick Law, 7  
 Onsite water management, 408–416  
 Opportunity maps, 282–284  
 Optical illusions, 168  
 Out-of-bounds hazards, 105  
 Overlay designs, 284  
 Owner, relationships with, 338–340
- Package pump stations, 358  
 Palmer, Arnold, 249  
 Palmetto Hall Plantation Club, 278  
 Pan, 329–331  
 Par:  
   for executive courses, 303  
   for full-sized golf courses, 303  
   in routing rating system, 264  
 Par 3s, 42  
   first occurrence of, 224  
   middle distances of, 224  
   playing time for, 42  
   in routing rating system, 271  
   tee size for, 126, 127  
 Par 4s:  
   on executive courses, 303  
   middle distances of, 224  
   tee size for, 125  
 Par 5s:  
   on executive courses, 303  
   middle distances of, 224  
   playing time for, 42  
   in routing rating system, 271  
   tee size for, 125  
 Parallel lines, 176  
 Par balance by hole, 264  
 Park, Willie, Jr., 3  
 Parking, 185, 187  
 Participation (in recreational process), 190–192  
 Pasatiempo, 86, 198  
 Paved roads, 93, 94  
 Payment, method of, 320  
 Pebble Beach, 17, 34, 38, 41, 52, 90, 91, 100  
 Peer review of design, 284  
 Penal design, 50, 51, 165  
   depressions/mounds in, 141  
   hazards in, 138  
   of individual holes, 139, 140  
 Penal holes, 21, 24, 37  
 Performance bonds, 320  
 Permit process:  
   and accuracy of mapping, 281  
   and computer technology, 279, 288–289  
   environmental issues in, 220  
   in evolving design process, 276  
   plans for, 287–289  
 Perspective drawings, three-dimensional, 295  
 Pesticides, 378, 379  
 Pete Dye Golf Club, 273  
 PGA Championship (2004), 24  
 PGA West Stadium Course, 170, 171, 331  
 Philadelphia Cricket Club, 283  
 Phipps, Bob, 394  
 Pinehurst, 251  
 Pine straw, 65, 85, 86, 102  
 Pine Valley, 17, 171, 184  
 Pitch-and-run shot, 73, 74  
 Plans, 7. *See also* Construction documents  
   computer-rendered, 289–290  
   earthmoving, 313  
   feature, 309, 310  
   grading, 311, 313  
   grading and drainage, 312  
   grassing, 316  
   for improvements, 381  
   irrigation, 315  
   for permits, 287–289  
   staking, 307  
 Plan books, 308  
 Planimeter, 147  
 Planning boards, 399  
 Planting:  
   dates for, 373  
   methods of, 365  
   sequence for, 368–370  
 Playability, rating, 273  
 Playing of game:  
   play patterns, 146  
   quality factors in, 33  
   in recreational process, 190–192  
   time for, 42  
 Pleasure:  
   characteristics producing, 167  
   levels of, 165–167

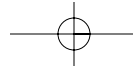
- Plowing, 365  
*Poa annua*, 107, 108  
 Polyethylene (poly) pipe, 361  
 Polyvinylchloride (PVC) pipe, 361, 362  
 Pond water:  
     for irrigation, 212  
     in routing rating system, 273  
 Pop-up sprinklers, 58  
 Practice putting greens, 224  
 Practice ranges, 224, 272  
 Prebid site inspections, 318, 319  
 Preconstruction meeting, 323  
 Precontract meeting, 321–322  
 Presidio Golf Course (San Francisco, California), 421  
 Prestwick (Scotland), 76, 77, 167, 177  
 Presubmittal meetings, 287, 288  
 Private golf clubs, gender separation at, 48  
 Processed water, 359  
 Professional relationships (in construction sequence), 338–340  
 Professional skills of architects, 201  
 Progression, 40–41  
 Project manager, 254  
 Property lines, 222  
 Property line maps, 386  
 Proportional relationships, 169  
 Proposals, 319  
 Pro tees, 37  
 Pseudominimalism, 18  
 Public golf courses, golfers' skills at, 48  
 Pump station:  
     installation of, 359–360  
     selection of, 357–358  
 Purchased water, 359  
 "Pushup" greens, 70  
 Putting greens:  
     design of, 146  
     mowing of, 378  
 Putting surfaces, xi  
     acceptable scale for, 169  
     planning for function/maintenance of, 108–113  
     planting, 368  
     strategy in, 113  
     visibility of, 224  
 PVC pipe,  $\simeq$  Polyvinylchloride pipe  
  
 Quattrocchi, Guy, 196  
 Quick-coupler valves, 363  
  
 Rae's Creek, 38–39, 104  
 Railroad ties, 47, 95  
 Rain:  
     and penal design, 51  
     percolation of, 70  
 Rating system for routings, 264–273  
     approach shot balance, 271  
     average distance from green to tee, 272  
     balance between nines, 264  
     change of direction, 271  
     development factors, 273  
     evaluation of nearby development, 272  
     first par 3, 271  
     handicap flow, 271  
     length and par, 264  
     par balance by hole, 264  
     par 3/par 5 direction, 271  
     pond acreage, 273  
     practice range orientation, 272  
     relationship of clubhouse and golf holes, 272  
     start and finish directions, 271  
     stream/wetland crossings, 272–273  
     travel between lots, 273  
     tunnels/surface street crossings, 273  
 Ration method, 65  
 The Raven at Three Peaks, 134  
 Raynor, Seth, 4, 6, 124  
 "Reading the break," 179  
 Recreational process of golf, 181–192  
     anticipation in, 181–183  
     arrival impression in, 184–190  
     cooldown phase in, 192  
     human relations in, 188–190  
     playing of game in, 190–192  
     remembrance in, 192  
     travel home in, 192  
     travel to experience in, 182–184  
 Redan hole, 74, 75  
 Redford, Robert, 419  
 Red sand, 86  
 Red tees, 37  
 Remembrance (in recreational process), 192  
 Remodeling of old courses, 28  
 Rendering plans, computer technology for, 289–290  
 Research and analysis, 209–211  
 Resolution Trust, 402  
 Resource mapping, 214  
 Restoration of courses, 392–394  
 Rhizomes, 378  
 Rhythm, visual, 171–172  
 Richardson, Forrest, xii, 259, 285  
 Rights-of-way, 222, 386  
 Ringing, 345  
 Risk management, 28–29  
 River Course (Keystone, Colorado), 63  
 Rivertown (St. Augustine, Florida), 264–274  
 Roads, 93, 94  
 Road Bunker, 94  
 Road hole bunkers, 51  
 Road Hole (Old Course at St. Andrews), 94  
 The Robert Cupp Course (Hilton Head Island), 278  
 Roche, Paul, 364  
 Rocks, 88–93  
     in site assessment, 220  
     in visual message, 177  
 Rockwell, Norman, 153  
 Roll of golf balls:  
     and slopes of greens, 67–72  
     and use of mounds, 73  
 Root media, 110, 127  
 Root rake, 326  
 Ross, Donald J., 4, 5, 11, 60, 61, 123, 124, 146, 193–195, 224, 308, 393

- Roughs, 55–65  
 and contour mowing, 63, 65  
 deep, 55  
 evolution of, 56–59  
 fertilization of, 377  
 friendly, 63  
 grass choices for, 60, 62  
 and Hurdzan/Fry grassing philosophy, 62  
 integration of fairways and, 132–134  
 intermediate, 63  
 nonturf vegetation for, 64, 65  
 planting, 368, 369  
 and surface enrichment, 151  
 and trees, 58, 60, 61
- Rough finish grade, 328
- Rough grading, 330, 345
- Rough subgrade, 328, 343
- Routing:  
 approach shot balance, 271  
 average distance from green to tee, 272  
 balance between nines, 264  
 change of direction, 271  
 and development factors, 272, 273  
 in evolving design process, 259–263  
 first par 3, 271  
 genius in, 229  
 handicap flow, 271  
 as learned skill, 285  
 length and par, 264  
 par balance by hole, 264  
 par 3/par5 direction, 271  
 pond acreage, 273  
 practice range orientation, 272  
 rating system for, 264–273  
 relationship of clubhouse and golf holes, 272  
 start and finish directions, 271  
 stream/wetland crossings, 272–273  
 in team approach, 258  
 travel between lots, 273  
 tunnels/surface street crossings, 273
- Routing plans, 8, 217
- Routing the Golf Course* (Forrest Richardson), xii, 259, 285
- Royal Birkdale, 414, 416
- Royal Canadian Golf Association, 414
- Royal County Down (Northern Ireland), 40, 97, 172
- Royal Dornoch (Scotland), 224
- Royal North Devon, 47
- Royal St. Georges, 76
- Royal Troon, 77
- Ruins (as hazards), 95
- Ryder Cups, 60
- Safety, 25–32  
 blind areas, 29–31  
 distances for, 25–26, 28  
 indemnification, 28  
 and minimalist design, 18  
 and modern golf equipment, 32  
 risk management, 28–29  
 in routing, 259–261  
 and street crossings, 273  
 warning signs, 31, 32
- Safety buffers, 224  
 near tees, 129  
 water as, 105
- St. Albans Country Club (Missouri), 137, 342
- St. Andrews, 177
- Sand:  
 consistent use of, 179  
 in green construction, 345, 347–348  
 for surface enrichment, 151  
 texture of, 85  
 in visual message, 177
- Sand Barrens (Swainton, New Jersey), 178
- Sand Hills (Mullin, Nebraska), 18
- Sand particles, 46
- Sand pumps, 330
- Sand traps, 80. *See also* Bunkers  
 construction of, 345, 356  
 edging, 379, 380  
 form/function of, 111  
 materials for, 85  
 slope of, 111
- “Saturday Afternoon” (A. B. Frost), 184
- Scale:  
 for base maps, 307, 311  
 and beauty/ugliness, 169  
 for detailed drawings, 311  
 for determining distances, 168  
 and frames of reference, 168  
 lower limit of, 168–169  
 for maps, 386  
 of massive forms, 173  
 and perceived ugliness, 163  
 in visual messages, 167–169
- Schedules, 323
- Schematic design:  
 computer technology in, 284–285  
 cost estimates based on, 273  
 in ideal design process, 222, 232  
 for individual holes, 138–139  
 time required for, 285
- Schreiner, Craig, 60
- Scientific research, 418–419
- Scoria, 86
- Sediment ponds, 105
- Seedbeds, 365–370  
 architect’s approval, 366–368  
 and damage to irrigation, 357  
 final grading, 366, 367  
 planting methods, 365  
 planting sequence, 368–370  
 preplant amendments, 368  
 soil preparation, 365, 366
- Seed testing, 317
- Selective thinning, 325–327
- Self-loading pan, 330
- Seminole (Palm Beach, Florida), 46, 195, 393
- Seniors’ tees, 127
- “Sensing” sites, 217–219
- Sensory diversions, 155, 157
- Seth Raynor, 74

- Shackelford, Geoff, xiii
- Shade, 98, 99, 148
- Shadow bunkers, 332
- Shadow Creek (Las Vegas), 18, 208, 273
- Shapes:
- complementary, 175–176
  - free-form, 174
- Shaping:
- in construction sequence, 331–334
  - reasons for, 332
- Shelter Harbor (Westerly, Rhode Island), 93
- Shorehaven (East Norwalk, Connecticut), 394
- Shot values, 38–40
- and approaches around greens, 80
  - and bunkers, 84, 150
  - and mounds/slopes, 75
- Shrubs, 149
- Signature courses, 402
- “Signature” holes, 249–250
- Simplified construction method (subsurface greens), 111
- Site analysis and feasibility study, 207–216
- existing vegetation, 214, 215
  - irrigation water, 212–213
  - legal restrictions, 215
  - maintenance cost, 216
  - and reasons for golf course failures, 209
  - report from, 283
  - site assessment in, 209–211
  - soil and microclimates, 211–212
- Site assessment, 209–211, 220, 280, 281
- Site conditions, cost estimating and, 147
- Site inspections, prebid, 318, 319
- Site map, 225
- Sitwell Park (England), 67
- Size of course features, 163. *See also* Scale
- determining, 168
  - as indicator of meaning, 172
- Skill levels of golfers, 48, 127–128
- Slicer-type pan, 329, 330
- Slicing:
- and placement of water hazards, 103, 104
  - and routing, 224
- Slopes, 42, 43, 65–72
- cutting heights for, 67, 69
  - and form of green, 111
  - of greens, 67–72
  - limits of activity of, 66
  - and maintenance, 65
  - methods for describing, 65, 66
  - mounds vs., 72, 73
  - rules of thumb for, 224
  - severity of, 66
  - and shot value, 75
  - for tees, 127
  - of traps, 111
  - in visual message, 173
  - and water hazards, 103
- Smart Growth, 403–416
- benefits of golf courses in, 405–408
  - concept of, 403
  - in Huntsville Mountain, Alabama, 425
  - and on-site water management, 408–416
  - principles of, 405
- Sod wall bunkers, 82, 94, 95
- Soils:
- amended, 347–349, 354, 365, 366
  - assessments of, 211–212
  - preparation for seedbeds, 365, 366
- Soil moisture sensors, 363
- Soil profiles, 221
- Solvent weld PVC pipe, 362
- Special features of sites, 222, 223
- Specifications, 317. *See also* Construction documents
- bid documents, 318
  - changes to, 339
  - detailed, 317–318
  - site-specific, 147
- Specimen trees, 100
- Speed of rolling balls, slopes and, 67, 69
- The Sports Turf Research Institute, 414
- Spring seeding, 373
- Spring start-up, 380
- Sprinkler heads:
- adjusting locations of, 360–361
  - backfilling, 354
  - determining locations of, 352
  - low-volume, 363
  - swing joints for, 362–363
- Sprinkler patterns, 352–354
- Spruce, 102
- Spyglass Hill, 247
- Stability, communicating, 170
- Stacked sod, 47
- Staking:
- in construction sequence, 323, 324
  - grade stakes, 327, 328
  - in green construction, 342–343
- Staking plans, 307
- Standards, safety, 259
- Standard notation, 195–197
- Standing water, 220
- Start dates, 323
- Starting holes, 222
- Steel, Donald, 18
- Stick and ball drawings, 222
- Stolons, 378
- Stone foundations, 94
- Stone walls, 91, 92, 334, 335
- Straka, Jason, 14, 284
- Strategic design, 51, 53
- depressions/mounds in, 141, 144–146
  - for greens, 113–124
  - hazards in, 138, 139
  - of individual holes, 140–141
- Strategic holes, 21, 24, 37, 38
- Stream crossings, 272–273
- Stresses, environmental, 107, 108
- Subliminal messages, 217
- Subsurface drainage:
- on composite grading plans, 313
  - installing pipes for, 327, 328
- Subsurface green construction, 111

- Subsurface water, 358
- Suppliers, relationships with, 203
- Surface drainage, 76  
 design of, 219  
 and design of individual holes, 147  
 and form of green, 111  
 green design for, 117
- Surface enrichment, 148–152
- Surface street crossings, 273
- Surface water, 70, 359
- Surveying, 323, 324
- Survival (level of pleasure), 165
- Survival of the fittest, 107
- Swales, 79
- “Sweetness of the curve,” 172
- Swing joints, 354, 355, 362–363
- Symbols:  
 bunkers as, 157, 158, 160  
 cultural, 154–155  
 emotional associations with, 157, 158  
 golf courses as, 160  
 presentation of, 160
- Symmetry, 169–171
- Tanks, 6
- Target areas:  
 hazards defining, 115  
 and margin or error, 117
- Target size, 39, 110
- TCF, *see* The Conservation Fund
- Team approach to design, 254–259
- Tees, 37, 125–131  
 concept of, 125, 126  
 construction of, 341–342, 356  
 distinctive looks for, 129, 131  
 fertilization of, 377  
 form/function of, 126  
 free-form multiple-level, 125, 174  
 “landing strip,” 168  
 linear, 125  
 multiple, 48  
 planting, 368  
 positioning, 222  
 size of, 126, 127, 224  
 slopes/locations of, 127–131  
 surface enrichment for, 148, 151  
 visibility from, 129
- Tee box, 125, 126
- Temperature, seeding, 373
- Tender documents, 290
- Thinning, 325–327
- Thomas, George, 4, 5, 261
- Thompson, Stanley, xiii, 86, 193, 261, 262
- Three-dimensional perspective drawings, 295
- Three-lobe greens, 147
- Tile drainage:  
 and form of green, 111  
 in green construction, 351–352
- Tillers, 378
- Tillering, 378–379
- Tillinghast, A. W., 55, 74
- Toomey, Howard, 7
- Topdressing, 379
- Top-loading, 330
- Topographic maps, 386
- Topography:  
 interval of, 212  
 map conventions for, 292  
 rhythm of, 171, 212
- Topsoil:  
 removal/storage of, 327, 328  
 specifications for, 318  
 and tee construction, 341, 342
- Topsoil greens, construction of, 70
- Toronto Terror* (James A. Barclay), xiii
- Tour 19, 251
- Tournament Players Club (TPC), 253  
 Jacksonville Stadium Course, 114  
 at Sawgrass, 40, 53, 253
- Tournament qualities of courses, 34, 35, 37
- TPC, *see* Tournament Players Club
- Tractors, 6
- Tractor-drawn mowers, 56, 57
- Travel:  
 back to home, 192  
 to experience, 182–184  
 between holes, 224  
 between lots, 273
- Tread vehicles, 6
- Trees:  
 distance between, 102  
 functions of, 97, 98  
 guardian, 100  
 guidelines for use of, 100–102  
 as hazards, 97–103  
 and rough, 58, 60–62  
 selected thinning of, 325–327  
 selection of, 102–103  
 specimen, 100  
 for surface enrichment, 149, 151  
 variety of, 102  
 in visual message, 176–177
- Trenches, irrigation, 354
- Troy Burne (Hudson, Wisconsin), 104, 105, 152
- Trucks, construction, 330, 331
- Trump, Donald, 20
- Trump International, 20
- Tufts, Richard, 195
- Tunnel crossings, 273
- Turfgrasses, xi, 371–380  
 biostimulants for, 378  
 cutting heights for, 59  
 and erosion threat, 372  
 germination factors, 372, 373  
 grow-in stage for, 372  
 hole locations and healing of, 108–110  
 during maturation process, 379–380  
 micronutrients for, 377–378  
 moisture for, 375–376  
 mowing, 378  
 nutrition for, 376–378  
 pesticides for, 378

- root media for, 110, 127  
 spring start-up for, 380  
 stages of establishing, 371–372  
 temperature for seeding, 373  
 tillering, 378–379  
   in visual message, 176  
 Turfgrass management, 108  
   and contoured fairways, 134–136  
   and form following function concept, 108  
*Turf Manager's Handbooks for Golf Course Construction, Renovation, and Grow In* (Charles White), 370  
 Turn point, 261
- Ugliness:**  
   awesomeness vs., 165  
   interpretation/appreciation of, 160  
   perceptions of, 153. *See also* Visual messages  
   roots of, 162–164  
 Undulation, 65  
 Ungovernable elements, 163, 164  
 U.S. Department of Agriculture, 418  
 U.S. Equestrian Team (USET), 254, 255  
 United States Golf Association (USGA), 364, 418  
 Urban sprawl, 399–403  
 USET, *see* U.S. Equestrian Team  
 USGA, *see* United States Golf Association  
 USGA accuracy table, 39  
 USGA Course Rating Handbook, 39, 117  
 USGA Method:  
   for green construction, 71, 345–349  
   for subsurface green construction, 111  
 Utilities, 222  
 Utilities maps, 386
- Valderrama, 414, 416  
 Valley of Sin (Old Course at St. Andrews), 78, 79  
 Values, balancing, 429  
 Vegetation. *See also specific types, e.g., Trees*  
   clearing and grubbing of, 324–325  
   evaluation of, 221  
   existing, 214, 215  
   mapping of, 214  
   removing, 365  
   selective thinning of, 325–327  
   and varying needs for water, 361  
 Vertical rhythm, 171  
 Vinchesi, Brian, 364  
 Vineyard Club (Martha's Vineyard, Massachusetts), 416–417  
 Visibility, tee location and, 129  
 "The vision," 280  
 Vision, mechanism of, 154  
 Visual architects, 22–23  
 Visually-defining elements, 91  
 Visual messages, 153–180  
   balance and symmetry, 169–171  
   conveying, 157–160  
   and cultural symbols, 154–155  
   discovering, 155–157  
   force of objects, 179–180  
   form, 173–176  
   materials, 172–173, 176–179  
   and mechanism of vision, 154  
   and perceptions of beauty/ugliness, 153  
   and pleasure levels, 165–167  
   roots of ugliness in, 162–164  
   scale, 167–169  
   size, 172  
   sources of beauty in, 160–162  
   understanding, 167–180  
   and visual rhythm, 171–172  
 Visual order, 169, 175  
   balance and symmetry for, 169–171  
   force of objects in, 179–180  
   and forms, 172–176  
   and materials, 172–173  
   and size, 172  
   visual rhythm in, 171–172  
 Visual rhythm, 171–172
- Walking golf courses:**  
   and average distance from green to tee, 272  
   distances on, 42  
 Walking golfers, slopes and, 65  
**Walls:**  
   in construction sequence, 334–336  
   for surface enrichment, 149  
 Warning devices, 30, 31  
 Warning signs, 31, 32  
 Waste areas, 80  
*Wastewater Reuse for Golf Course Irrigation* (United States Golf Association), 364  
**Water:**  
   crossings of, 272–273  
   existing, design of course and, 221–222  
   for irrigation, 212–213  
   movement of, 70  
   onsite management of, 408–416  
   sources of, 358, 359  
   standing, 220  
   used by North American golf, 397, 398  
   in visual message, 177, 178  
 Waterfalls, 18  
 Water features, 412–414  
 Water hazards, 103–106  
 Water-saving devices, 363  
 Water troughs, 94  
 Water use rights, 222  
 Watson, Tom, 94  
 Weather stations, 213, 363  
 Weaver, Jerry, 337  
 WeaverRidge (Peoria, Illinois), 72, 337  
 Wee ones' tees, 37  
 Wells, 359  
 Westward Ho! (North Devon, England), 334  
 Westwood Country Club (Rocky River, Ohio), 394–395  
 Westwood Plateau (Coquitlam, British Columbia), 88–90, 153, 160, 173, 293, 306, 324, 334, 344, 345, 355, 431  
**Wetlands:**  
   buffer zones around, 403  
   on constraints map, 211



- Wetlands (*cont'd*)  
  crossings of, 272–273  
  EPA rules on, 402  
Wetwell, 359–360  
Wheelchair-accessible tees, 37  
Whelchel, David, 14, 95, 297  
Whistling Straits (Wisconsin), 21, 24, 77  
White, Charles “Bud,” 370  
White, Robert, 193, 394  
White sand, 151  
White tees, 37  
Whitten, Ron, 251  
Widow’s Walk Golf Course (Scituate, Massachusetts),  
  212, 214, 216, 218, 220, 221, 253, 421  
Willowbend (Cape Cod), 235, 236  
Wilson, Dick, 7  
Wind:  
  and mounds, 75, 76  
  and penal design, 51  
  and sprinkler locations, 361  
Women’s tees, 37, 127  
Wonder (level of pleasure), 165  
Wood chip mulch, 65  
Wooden bulkheads (as hazards), 95, 96  
Wood (in visual message), 177, 178  
Wood walls, 334  
Working drawings, 307, 390  
World War II, 54–55  
Wound rubber band Haskell ball, 26  
“Wow” factor, 34  
Wynn, Steve, 208  
  
Zoldoske, David, 364  
Zoning, 41, 399, 400  
Zoning restrictions, 222  
Zoysia grass, 179

