Aquatic facilities, 908–917
  competition swimming and diving pools, 913–917
  public swimming and diving pools, 910–913
  residential swimming pools, 908–910
  tubs, 908, 909
Arched peak connections, 381
Arches, 204, 1013
Architectural area, 1023, 1024
Architectural Barriers Act (ABA), 41, 68
Architectural construction documentation, 142–160
  for building information modeling, 151–159
  construction specifications, 146–151
  drawings, 142–146
  procurement documents, 160
Architecturally exposed structural steel (AESS), 229, 341–342
Architectural panels, 401, 402
Architectural shielding, 902
Architectural volume, 1023–1024
Architectural woodwork, 548–549
Area(s).
   See also Athletic areas; Recreation areas
     architectural, 1023, 1024
     assembly, 626
     audience, 822, 845
     audiovisual viewing, 811–812
     calculations for, 1023
catchment, 684
chemical storage, 833
dining and bar, 846–847
front-of-house, 846
high-impact, 607
net assignable, 1024
preparation, 818
private, in schools, 861
of refuge, 644, 645
of rescue assistance, 626
for skylighting, 516
thermal expansion of, 1022
urban, 981, 988–991
for warm-air furnace, 711
Area dividers, rooftop, 502
Area lighting, 1002–1003
Arena football, 827
Arid climates, 88, 89, 282
Armchairs, 857
Armoires, 859
Article titles, 150
Articulation, 102, 105
Art rooms, 865
Ash dumps, 611
Ashlar stone wall patterns, 980
Asphalt, 472, 477
Assembled thresholds, 461
Assembly areas, signage in, 626
Asset resilience, 110
Assistive listening systems (ALS), 56
ASTM standards:
  on anchoring and reinforcement, 194
  on clay masonry, 182
  on concrete masonry, 185
  on mortar and grout, 191–192
  on reinforcing bar sizes, 170
  on stone, 188
Astragals, 550
Astragal weatherstripping, 462
Athletic areas:
   baseball and softball, 955–957
   bocce, 962
   field and court construction, 965–966
   field hockey, 963
   football, 957–960
   lacrosse, 963
   rugby, 963
   sitework for, 955–966
   soccer, 960–962
   track and field, 964
Athletic equipment, 827–833
  for arena football, 827
  for basketball, 827–828
  for billiards, 828
  for boxing, 829
  for darts, 829
  for fitness, 829–830
  for gymnastics, 830–831
  for ice hockey, 831–832
  for judo, 832
  for karate, 832
  for pocket billiards, 828
  for snooker, 828
  for soccer, 832
  for table tennis, 832–833
  for weightlifting, 833
Athletic rooms, 919, 920
At-rest soil pressure, 309, 310
Atriums, 94
Audible alarms, 776
Audience area, 822, 845
Audio intelligibility, 813–814
Audiology spaces, 808
Audio-visual equipment, 810–816
  audio intelligibility for, 813–814
  design considerations, 810–812
  and human factors, 813
  in presentation rooms, 814
  sight lines for, 812–813
  support spaces for, 814–816
Audiovisual systems, 773
Audiovisual viewing area, 811–812
Auditing, security, 126
Autodesk 3DS Max, 151
Automated book storage and retrieval systems, 810
Automatic banking systems, 56
Automatic drip valves and filters, 983
Automatic exhaust dampers/louvers, 436
Automatic intake dampers/louvers, 437
Automatic swing gates, 786
Automatic valve assemblies, 982
Awareness, in universal design, 20
Awnings, 522–524
AWPA (American Wood Preservers’ Association), 238
Axially loaded spread footings, 285
Back-bar storage cabinets, 804
Backboards, basketball, 828
Backfill, 308–310, 935
Backflow prevention, 660, 661, 666, 983
Background sound, 102
Backsplashes, 843–845
Baggage conveying equipment, 658
Bakeries, equipment in, 800–801
Baker’s tables, 801
Balance and center match method, 249
Balance beams, 831
Balanced doors, 846–847
Balanced doors, 846–847
Balance match method, 249
Balconies:
   concrete, 331–332
   of performance theaters, 105
   in superstructures, 344–345
Ballasts, lighting, 757
Ballast pavers, 511
Ballistics-resistant construction, 125–126, 907–908
Balloon framing, 361
Ball valves, 673
Balustrades, 618, 1014
Bamboo flooring, 593
Banded slabs, 331
Banquettes, 847, 848
Bars (metal):
   door, 464, 584
   grab, 62, 68, 623, 913, 916, 917
   as gymnastics equipment, 830, 831
Bars (pubs):
   area for, 846–847
casework for, 818
equipment for, 803–804
seating in, 846–847, 849
Barber shops, 794–795
Bar ends, decorative, 224
INDEX

Bar gratings, 222, 606
Bar hooks, 171
Barricades, lift-plate, 782
Barriers:
  - air, 433–434, 439
  - natural, 129–130
  - for ramps, 51
  - retractable, 783
  - site security, 781–782
  - vehicular deterrent, 781
  - weather, 413, 428, 468, 469, 472
Barrier assemblies, 392
Barrier free design, 19
Barrier walls, 783
Bases:
  - interior walls with stone, 556
  - seismic isolation of, 297–298
  - of shaft walls, 534
Baseball fields, 955–957
Base cabinets, 838, 841
Base caps, 550
Base flashing, 507, 509–511
Basements, 304–312
  - backfilling against, 308–310
  - in cold climates, 87, 281
  - excavations for, 931–936
  - foundations at, 286
  - walls of, 304–308
  - waterproofing, dampproofing, and insulating, 310–312
Baseplates, 348, 369
Base screens, 562
Base trim, wood, 549–550
Basic mortise-and-tenon joints, 366
Basins, fountain, 967
Basketball, 827–828
Basket racks, 638–639
Baths, hydrotherapy, 908, 909
Bathing facilities, 626, 908, 909
Bathrooms.
  - See also Public restrooms; Toilet rooms accessible, 57–63
  - accessories for, 623–624
Bathtubs, 60, 67, 68
Battens, 550
Batten seam roofing, 497–498
Battery power systems, 764–766
Bayley, John Barrington, 1008
Beadboard, 613
Bead patterns, adhesive, 253
Beams:
  - balance, 831
  - cantilevered, 344, 369, 1027
  - concrete formwork for, 166–167
  - connections of columns and, 335
  - fixed, 1026–1027
  - in glued-laminated construction, 370, 380
  - grade, 267
  - joist framing at, 343, 344
  - masonry, 202–203
  - needle, 290
  - post and beam construction, 368–369, 371
  - prestressed or post-tensioned, 333–334
  - ridge, 375, 386, 387
  - simple, 369, 1025–1026
  - spaced, 368–369
  - spandrel, 165
  - steel, 358, 533
  - wood, 356, 358
  - Beam-mounted lecture seating, 865
  - Beam pattern (lighting), 755
  - Beam-to-column formwork, 164
  - Beam-to-haunch connections, 335
  - Beauty shops, 794–795
  - Beds, 860
  - Bed joints, 193
  - Bed moldings, 550
  - Bednar, Michael, 19
  - Beer dispensers, 804
  - Behavior, human, 4–5
  - Bells, drilled piers with, 294
  - Belt bulk material conveyors, 656
  - Belt line joints, 416
  - Benches, 842, 887
  - Bent bolts, 257
  - Bent glass, 261, 569
  - Bermuda roofs, 497
  - Bevel butt joints, 416
  - Beveled edges, 570, 610
  - Bidding, 160
  - Bids, 679–675
  - Bikes, stationary, 829
  - Billiards, 828
  - Book depositories, 810
  - Book matching, 249
  - Book storage and retrieval systems, 810
  - Booster heaters, 668
  - Booster pumps, 662
  - Booths, 847
  - Bored piles, 293, 295
  - Boring logs, 276, 277
  - Boston hip roofs, 475
  - Bottle coolers, 804
  - Bottle rails, 803
  - Box beam sills, 430
  - Boxing, 829
  - Braced core systems, 340
  - Braced walls, 933
  - Bracing, 347, 361, 373, 376
  - Brackets, 169, 354, 305, 619
  - Branch wiring, 746–754
  - electrical panelboards, 752–753
  - floor wiring for workstations, 749–752
  - GFCI receptacles, 754
  - residential electrical wiring, 746–749
  - Brass, 210, 211, 670
  - Brazed joints, 672
  - Breechings, 701
  - Brick:
    - beams and lintels, 203
  - Blast-resistant construction, 122–124, 467, 906
  - BLCS (building-level controllers), 725
  - Blended edges, 47
  - Blender stations, 804
  - Blinds, 836
  - Blind glass, 568
  - Blind rivets, 258
  - Blow counts, 276
  - BMPs (Urban Best Management Practices), 926
  - Board and batten siding, 417
  - Board insulation, 414, 431
  - Boat trailers, 939
  - Bocce courts, 962
  - Body fit, 19
  - Boilers, 699–701, 703
  - Boiler flue economizers, 731
  - Bollards, 782
  - Bolts, 256, 257
  - Bolted alignments, 400
  - Bolted-down panels, 591
  - Bolted stringers, 592
  - Bolted tiebacks, 400, 401
  - Bolt mechanisms, door, 584
  - Bond classifications, 240
  - Bonding, of rooftop equipment, 766, 767
  - Bonding units, stone wall, 421
  - Bond patterns, masonry, 201
  - Book depositories, 810
  - Book matching, 249
  - Book storage and retrieval systems, 810
  - Booster heaters, 668
  - Booster pumps, 662
  - Booths, 847
  - Bored piles, 293, 295
  - Boring logs, 276, 277
  - Boston hip roofs, 475
  - Bottle coolers, 804
  - Bottle rails, 803
  - Box beam sills, 430
  - Boxing, 829
  - Braced core systems, 340
  - Braced walls, 933
  - Bracing, 347, 361, 373, 376
  - Brackets, 169, 354, 305, 619
  - Branch wiring, 746–754
  - electrical panelboards, 752–753
  - floor wiring for workstations, 749–752
  - GFCI receptacles, 754
  - residential electrical wiring, 746–749
  - Brass, 210, 211, 670
  - Brazed joints, 672
  - Breechings, 701
  - Brick:
    - beams and lintels, 203
Brick, (continued)
classification of, 182–183
columns, 202
ledges, 288
pavers, 948–949
projections of, 201
retaining walls, 972
shapes of, 183
sizes of, 183
stairs, 205–206

Brick veneers:
expansion joints with, 319, 514
on exterior walls, 406–408
flashing at, 510
louvers with, 435
on metal building systems, 896

Bridge joints, 317
Bridging, 343, 347, 358
Bronze, 210, 970
Bubbler heads and nozzles, 969, 983
Buffering, 685
Building blocks, 42–44
Building codes:
on fire protection, 732
on floor loads, 330
on interior glazing, 570
on lightning protection, 767
on rainwater harvesting systems, 685
on seismic recording instrumentation, 899
Building control systems, 126
Building ground grids, 766
Building information modeling (BIM), 151–159
applications of, 157
CAD vs., 152
and IFC model, 157–159
Loblolly residence, Taylors Island, Maryland (case example), 152–157
with SectionFormat™, 150
Building-integrated photovoltaics (BIPV), 762
Building-level controllers (BLCs), 725
Building management systems, 773–777
Building modules, 878–880
Building orientation, 74–75, 77–78
Building pressurization, 692
Building resilience, 108–140
assessment of, 140
components of, 108–113
and CPTED, 136–138
good design practices for, 130–136
hazard-specific, 113–114
lifecycle considerations in, 139
maintainability in, 114–115
overview, 108
and planning/design, 127
safety and, 115–121
security and, 122–126
sustainability in, 128–130
Building systems integration, 114–115
Built-in bathtubs, 678
Built-in lavatories, 677
Built-in sinks, 677
Built-up bituminous roofing, 477–479
Bulbheads, 916
Bulkhead sills, 450
Bulkheads, 450
Bumpers, 620, 781
Burglary-resistant vaults, 888
Burners, heating system, 700
Butt carriers, 836
Butterfly valves, 673
Butt-glazed storefronts, 450
Butt joints, 317
Butt-joint glazing, 268
B-vents, 634
Bypass doors, 448
Carbon dioxide extinguishers, 743
Carbon steel, 215, 224
Card technologies, 775–776
Carousel customer stations, 787
Carpet flooring, 383, 601–604, 608
Carpet maintenance equipment, 834
Carpet tiles, 601, 604
Cars:
elevator, 51–52, 642
passenger, 938
Carbon fiber composites, 317
Catalyzed epoxy paint, 565
Cash registers, 785, 787
Cathedral ceilings, 349
Cathodic protection, 714
Cathode ceilings, 349
Catlin, Jack, 28
Catenary cables, 891
Catenary cables, 891
Cathedral ceilings, 349
Catlin, Jack, 28
Cauled joints, 671
Cavity drainage, 197
Cavity walls, 409, 410, 445–446
Ceiling(s), 609–618
access panels in, 589, 590
basement, 312
cathedral, 349
carpet tiles, 601, 604
cart position indicators, elevator, 52
carrel, 868
carriers (drapery), 837
cascading effects, 133–135
cashier windows, 806
catch basins, 999–1000
catches, cabinets, 840
catchment areas, 684
cartoon imagery, 199
cap bead, wet/dry glazing with, 269
cap moldings, 550
carpenter, 938
carbon fiber composites, 317
carbon steel, 215, 224
card technologies, 775–776
carousel customer stations, 787
carpet flooring, 383, 601–604, 608
carpet maintenance equipment, 834
carpet tiles, 601, 604
carrel, 868
carrier, 837
cellophane, 21
ceiling, 349
cement:
integrally colored, 178
masonry, 192
microfine, 292
Portland, 192, 413, 600
SCMs, 175–176
suspended ceiling construction, 609–610
tongue-and-groove, 382
cellular deck systems, 338, 750
cell phone, 761
cell phone, 761
cell phone, 761
cell phone, 761
cell phone, 761

Cabinets:
backing for, 348
battery, 764
for fire suppression equipment, 637, 741
in hotel rooms, 859–860
shop-fabricated, 838–841
Cables:
catenary, 891
and systems furniture, 871–872
telecommunications, 769
Cable crash beams, 782
Cable trusses, 457
CAD (computer-aided design), 152
Call button boxes, 535
Cam lock brackets, 169
Cannon Design, 31
Canopies, 522–525
Cantilevered beams, 344, 369, 1027
Cantilevered floors, 360
Cantilevered slabs, 345
Cantilever needle beams, 290
Cantilever retaining walls, 975
Cap bead, wet/dry glazing with, 269
Cap moldings, 550
Cars:
elevator, 51–52, 642
passenger, 938
Carbon dioxide extinguishers, 743
Carbon fiber composites, 317
Catalyzed epoxy paint, 565
Cash registers, 785, 787
Cathedral ceilings, 349
Cathodic protection, 714
Cathode ceilings, 349
Catlin, Jack, 28
Cauled joints, 671
Cavity drainage, 197
Cavity walls, 409, 410, 445–446
Ceiling(s), 609–618
access panels in, 589, 590
basement, 312
cathedral, 349
calculator, 349
carpet tiles, 601, 604
carrel, 868
carrier, 837
cellophane, 21
ceiling, 349
cement:
integrally colored, 178
masonry, 192
microfine, 292
Portland, 192, 413, 600
SCMs, 175–176
suspended ceiling construction, 609–610
tongue-and-groove, 382
cellular deck systems, 338, 750
Cement:
Cementitious coatings, 429
Center glazing, 449
Centers of activity, 818
Central HVAC systems, 698–699
Centrifugal water chillers, 709
Ceramic tile, 477, 551–552, 611, 844
Chairs, 857, 861, 865
Chair rails, 550
Chaise lounges, 857
Channels, 218–220, 615, 616, 996
Channel-and-clip assembly, 596
Channel glass curtain walls, 458
Channel siding, 417
Channel studs, 563
Charbroilers, 800
Check dams, 998
Checkout equipment, 785, 787–788
Checkroom equipment, 794
Check valves, 673
Cheekwalls, 205
Chemical agents, security from, 124–125
Chemical-based fire-extinguishing systems, 732–733
Chemical finishes, for metals, 212
Chemically treated glass, 260
Chemical storage areas, 833
Chests, 859–860
Children:
anthropometric data for, 7–13
furniture for, 861
playgrounds for, 971–972
toilet rooms for, 68
water closets for, 59
Chiller controls, 726
Chimneys, 632, 700, 701
Chimney breasts, 631
Chimney crickets, 506–507
Chimney flashing, 505–506
Chords, 342, 377, 378
Chromium, 211
C-H studs, 534
Chutes, 659
Circuit breakers, 752, 754
Circular stairs, 354
Circulation paths, 45–46
Cisterns, 684
Civil utilities, 993–995
Class A hazards, 742
Classical architecture elements (orders), 1007–1017
arches, 1013
balustrades, 1014
details, 1011
doors, 1014
entasis, 1012
flutes, 1012
hidden, 1016–1017
intercolumnation, 1013
introduction, 1007–1009
moldings, 1009–1010, 1012
pediments, 1015
pilasters, 1012
rustication, 1016
superposition, 1014
volutes, 1012
windows, 1015
Classical revival design, 1008
Classification tables, OCCS, 148
Classrooms, 771, 861–864
Clay masonry units:
brick and tile classification, 182–183
control joints, 198
exterior walls, 405–410
reinforced pilasters, 203
Clean-burning fireplaces, 632–634
Clean dish tables, 802
Cleaning trolleys, 834
Cleanouts, 665
Clean rooms, 881–882
Clearances:
chimney, 632, 700
electrical panelboard, 752
fixed seating, 847
HVAC equipment, 634
knee and toe, 42, 64, 838
laundry equipment, 821
maneuvering, 42–44, 54–55
vending machine, 792–793
window treatment, 836
Clear deck space, 912, 913
Clear glass, 260
Clear repellants, 429
Clear width, 44–45, 54
Climate(s), 86–89
and building shell, 314–316
cold and permafrost, 86–87, 279–280
cold and underheated, 87–88, 281–282
designing for, 86–89
and foundations, 279–283
hot arid, 88, 89, 282
humid, overheated, 88, 89, 282–283
and HVAC systems, 691
and thermal comfort, 90–92
Climate change, 114
Clip angle anchors, 195
Closed risers, 383
Closed softs, 246, 382
Closed truck docks, 941, 942
Closers, door, 461, 584, 587, 588
Closets, telecommunications, 770
Closures, panel partition, 544
CNC (Computer Numerical Control) machining, 228
Coal tar, 477
Coated foam roofing, 491
Coated glass, 261
Coatings:
cementitious, 429
for concrete, 179, 180, 300, 301
elastomeric, 429
for glass, 186, 569
for metal, 212–213
Code-checking tools (BIM), 157
Coffee tables, 858
Cofferdams, 931, 932
Coffered ceilings, 618
Coils, metal, 214–215
Coiling doors, 463–464, 583
Coil saddle-type hangers, 168
Coil ties, 168
Coin trays, 806
Cold climates, 86–88, 279–282, 316
Cold deck bypass, 721
Cold-formed steel framing:
for exterior walls, 347, 409, 417, 418, 421
for floors, 343–344
for openings, 347–349
for roofs, 349–350
Cold storage rooms, 883–884
Collar ties, 350
Collector arrays, 705–707, 762–764
Colors, mortar and grout, 192–193
Colored concrete, 178, 399
Colored glass, 262, 567
Color hardeners/densifiers, 178
Color rendition index (CRI), 94
Color temperature, 94
Column cover connections, 401
Column equipment supports, 514–516
Columns:
concrete, 164–166, 174, 334, 335
foundation, 120, 291
glued-laminated, 380–382
masonry, 202–203
post and beam construction, 368, 369
steel, 296, 341
tube, 300
Combination oven-steamers, 880
Combination study-top and desktop, 865
Combined footings, 285
Combined heat rejection, 729
Combustion air, 631, 698
Combustion equipment controls, 726
Comfort, 19, 90–92, 822
INDEX

Commercial equipment, 785–806
  food service, 797–804
  laundry, 796–797
  mercantile, 785–796
  security and vault, 804–806
  teller and service, 806
Commissioning, HVAC, 694–696
Communications, 767–777
  in accessible design, 56–57
  building management systems, 773–777
  design considerations, 767–768
  with fountains, 971
  local area networks, 772
  telecommunications systems, 768–771
Community resilience, 110, 112–113
Compaction, 935–936, 989
  grouting, 292
  in accessible design, 56–57
  in gypsum board, 558–559
  in plaster, 562
  in masonry, 198–199, 202
  interior finishes at, 566
  in gypsum board, 558–559
  in building management, 775–776
  conveying, 642
  daylighting, 95, 760
  environmental, 809
  erosion, 924–925
  HVAC, 725–731
  for paint booths, 889
  low-voltage, 746, 775
  moisture, 915
  natural access, 136–138
  for paint booths, 889
  pneumatic, 689
  runoff, 925–929
  seismic, 899–900
  sound, 101, 261, 568, 898–899
  traffic, 783
  vibration, 898–899
  water vapor, 469
Controls (control systems):
  access, 136–138, 775
  air system, 726
  building, 126
  in building management, 775–776
  for sustainable products and procedures, 151
  UniFormat™, 147–149
  MASTERFORMAT™, 147–150
  Omniclass™ Construction Classification System for, 146–148
  SECTIONFORMAT™, 147–150
  for sustainable products and procedures, 151
  UniFormat™, 147–149
  for sustainable products and procedures, 151
  UniFormat™, 147–149
  CONTINUING EDUCATION, 127
  COMPRESSED AIR SYSTEMS, 713–716
  CONSTRUCTION ADHESIVES, 252–253
  CONSTRUCTION DRAINAGE, 903
  CONSTRUCTION DOCUMENTATION, 146–147
  COMPRESSED AIR SYSTEMS, 713–716
  CONTINUING EDUCATION, 127
  CONTRACT DOCUMENTS, 149–150
  CONTINUING EDUCATION, 127
  CONTRACT JOINTS, 176
  CONTRAST CONTROLS, 755
  CONTROLS (CONTROL SYSTEMS):
    access, 136–138, 775
    air system, 726
    building, 126
    in building management, 775–776
    conveying, 642
    daylighting, 95, 760
    environmental, 809
    erosion, 924–925
    HVAC, 725–731
    for paint booths, 889
    low-voltage, 746, 775
    moisture, 915
    natural access, 136–138
Positional information for an object or area, 101
  for paint booths, 889
  pneumatic, 689
  runoff, 925–929
  seismic, 899–900
  sound, 101, 261, 568, 898–899
  traffic, 783
  vibration, 898–899
  water vapor, 469
  CONTROL JOINTS, 176
shear-resisting, 975
in stone floors, 601
Controlled irrigation, 992
Control panels, 52, 637, 638
Control rooms, AV, 815
Convection ovens, 800, 801
Convection steamers, 800
Conventional trailers, 939
Conventional venting, of gas appliances, 635
Conversion factors, 1020–1021
Convertible furniture, 860–861
Conveying, 642–659
chutes, 659
design considerations for, 642
dumbwaiters, 653
elevators, 642–650
escalators, 652
material processing and handling equipment, 655–658
moving walks, 653–655
of rainwater, 684
wheelchair lifts, 651
Conveyors, 655, 656, 658
Conveyor ovens, 800
Cooktops, 65, 819, 820
Cooling, 90, 693, 708
Cooling loads, 729, 755
Cooling systems, 705, 707, 724
Cooling towers, 708–710
copper, 210, 221, 670, 903
Corinthian order, 1011
Cork flooring, 604
Corners:
of concrete formwork, 166, 176
of curtain walls, 455
door frame, 577
exterior wall connections at, 395, 398
framing for, 349
glass unit masonry at, 186, 542
masonry for, 202
metal corner conditions, 225
in post and beam construction, 369
siding for, 417
Corner beads, 562
Corner guards, 620
Corner offices, 851–852
Corner posts, 361
Corner tapes, 557
Corner trim, 550
Corinice trim, 550
Corridors, glazing in, 542, 543
corrosion, 194, 211
corrugated sheet metal roofing, 499
cost estimating tools (BIM), 157
cost information, 148, 150
Counters, 484, 487, 488, 509–511
counter shutters, 583
Countertops, 843–845
courts, athletic, 965–966
courts of Appeals Building (San Francisco, California), 899
courts, athletic, 965–966
cove base, 605
cove moldings, 550
CPCs (compound parabolic concentrators), 704
crime prevention through environmental design (CPTED), 136–138
cracking, concrete, 179, 301
Crash rails, 620
Crawl spaces, 288, 303–304
cricket walls, 976
crimped metal members, 225
cross channels, 616
crossflow, induced-draft cooling towers, 709
cross-flow spray booth, 889
Cross tees, 615
crown moldings, 550
crushed stone paving, 950
CS (steel) piping, 670
cubic shapes, 218
Cubbies, built-in, 866
cubicles, toilet and bath, 621–622
cultural appropriateness, 22
cubicles, toilet and bath, 621–622
cultural appropriateness, 22
curb flange expansion joints, 512
curb inlet storm drainage structures, 999
curb parking, 944
curbside fire department connections, 737
curb valves, 666
curtains, stage, 825
curtain doors, 464
curtain walls, 267, 435, 447–450, 452, 458
curved panels, glass block, 207, 542
cushioned assembly, of resilient wood flooring, 596
cushioned sleepers, 595
cut stone, 189, 190
cut-through islands, 47
cutting:
glass, 570
wood veneers, 249
CVDD (constant-volume dual duct) system, 715, 716
cybersecurity, 126

damage, from natural disasters, 108
dampproofing, 311–312
darts, 829
data files, in MasterFormat, 150
data systems, 766, 769
daylight compensation control, 760
daylighting, 92–95, 755
dc (direct-current) photovoltaic systems, 763–764
deal trays, 806
decay, wood, 236, 237
deciduous trees, 238
decimal equivalents, 1019
deck nozzles, 970
decks and decking:
composite, 373
concrete, 336–338
flushing at, 510
metal, 337–338, 350–351, 404
for porous paving, 947
roof, 350–351, 382, 386, 468, 469, 483, 489, 511
shrinkage of, 236
wood, 371–373, 382
decorative coatings, concrete, 179, 180, 300
decorative gas appliances, 635
decorative metals, 224–228
decorative pools, 966
decorative silk-screened glass, 262–265
decorative thin-wall tiles, 596
dedicated outdoor air systems, 717
deep foundations, 293–296
deep wells, 930
defects, concrete surface, 178–180
defensible space, 136
deflection, 410, 528
deradipation, soil, 989
degrees, 1021
dehumidification, 726–728
density curves, sprinkler design, 733
dental operatories, 808, 809
descriptions, preliminary, 148
desiccant devices, 727–728
design-build applications, 148
Design intent, 691
Design vehicles, 938–939
Desks, 860, 865
Detailing, metal, 224–225
Detectable warnings, 56, 627
Detection equipment, 805–806
Detention facilities, 917
Dewatering, 930
DFs (drinking fountains), 681–682
Diagonal bracing, 347, 516
Diagonal curb ramps, 47
Diaper changing tables, 861
Diffusers, 722
Dimensional lumber, stairs from, 383
Dimensioning, 143, 145, 538–539
Dimensional stone, 552, 598
Dimming, of lighting, 755
Dining areas, 846–847
Direct bearing connections, 400, 401
Direct-current (DC) photovoltaic systems, 763–764
Direct-expansion HVAC systems, 698, 699
Directional dependencies, 134, 135
Direct lighting, 755
Direct solar irradiation, 82–85
Direct venting, 635–636
Disabilities, children with, 971
Discipline jurisdictions, 149
Disconnect switches, 752
Discussion style classroom arrangements, 864
Dishwashers (dishwashing equipment), 64, 801–802, 820
Disinfection, 685
Dispatching systems, elevator, 644
Display reach-in refrigerators, 802
Disposal, lamp, 758
Distortion, angular, 283
Ditching, 930
Dividers, 502, 592
Diving boards, 913
Diving pools, 910–917
Docks, truck, 941–942
Documentation, 1002. See also Architectural construction documentation
Dolomitic limestone, 552
Domes, 879–881
Domed ceilings, 618
Dome forms, 168
Domestic water distribution, 660–661
Domestic water heaters, 666–668
Doors:
  accessible, 54–56
  acoustic, 898
  ballistic-resistant, 907
  blast-resistant, 467
  classical, 1014
  exterior, 459–467
  glazing in, 542
  interior, 570–583
  kenvel, 919
  protection for, 620–621
  radiation shielding, 901
  revolving, 783–784
  in series, 56
  in storefronts, 448–449
  Door frames, 208
  Doorknobs, 584
  Door openings, 348, 361, 385, 571
  Doric order, 1011, 1017
  Double-acting interior doors, 578
  Double doors, 571
  Double drainage blades, 436
  Double facade curtain walls, 458
  Double-pitched framed skylight assemblies, 519
  Double-stud partitions, 533
  Door joint anchors, 410, 555
  Dowels, for footings, 289
  Drained cavity walls, 318, 392, 514
  Drapery, 836–837
  Drawers, transaction, 806
  Drawings, 142–146
  Drawing notations, 150
  Drains and drainage:
    of cavities, 197
    condensate, 703
    in floors, 666
    for plumbing fixtures, 663
    for porous paving, 947–948
    rainwater, 682–685
    for retaining walls, 975
    from roofs, 469–470, 493–495, 501
    sanitary waste, 664, 665
    storm water, 682–683, 994–995, 999
    subdrainage, 302–303
    subsurface systems for, 993–994
    for trenches, 998, 999
  Drain-down space heating and domestic hot water solar systems, 705
  Drilled piers, 294
  Drinking fountains (DFs), 681–682
  Drips, stone, 423
  Drives, elevator, 648
  Driven piles, 293, 295
  Drop panels, 165
  Dry centrifugal pumps, 967
  Dry-chemical fire-extinguishing systems, 732, 733, 743
  Dry coolers, 711
  Dryers, 797, 821
  Dry gaskets, 427
  Dry glazing, 268, 453
  Drying, wood shrinkage and, 234
  Dry-placed stone retaining walls, 972
  Dry spline joints, 426
  Dry wells, 303
  Dual condenser water chillers, 730
  Dual-duct air distribution, 715
  Dual-line expansion joints, 319
  Ducts, 711, 750
  Duct banks, underground, 1003
  Ducted HVAC systems, 711, 712
  Duct enclosures, 536
  Dumbwaiters, 653
  Durability, 113

E

Early childhood classrooms, 861
Earthwork, 924–925
EAS (electronic article surveillance) devices, 805
Ease of passage, 822
Eaves, 349, 350, 387, 472, 476, 477
Eccentric bearing connections, 401
Echo and echo/stress treatment rooms, 808
Economizers, 728–731
Edges:
  acoustic ceiling tile, 610
  concrete, 178
  glass, 570
  gypsum board, 556, 557
  ramp and landing, 51
  roof, 486, 509
  of sports fields and courts, 966
  wood deckings, 372

Edge clamps, fabric, 891
Egress, emergency, 627, 644
EIFS (exterior insulation and finish systems), 412–413, 428–429
Elastomeric coatings, 429
Elastomeric membrane roofing, 484–485
Elastomeric pipe insulation, 674
Electrical components, 871, 879, 889, 902
Electrical devices, 747
Electrical outlet boxes, 540
Electrical panelboards, 752–753
Electrical services, 744–767
branch wiring, 746–754
busways, 746
facility power generation, 762–765
industry standards, 744
lighting, 754–761
lighting protection, 766–767
low-voltage motor control centers, 746
motor starters, 744–745
substations, 744, 745
transformers, 744
Electrical trench ducts, 338
Electrical utilities, 1001–1003
Electric heating systems, 696, 711
Electric traction elevators, 643, 646–647, 649
Electric water coolers, 681–682
Electrochromic glass, 568
Electromagnetic spectrum, 93
Electronic article surveillance (EAS) devices, 805
Electronic fire alarm/communications systems, 776
Electronic keyboards, 826
Electronic organs, 827
Elementary classrooms, 862
Elementary water distribution systems, 712
Elevated buildings, 280
Elevated water tanks, 662, 663, 1000
Elevator(s), 642–650
accessibility of, 51–52
cars, 642
electric traction, 643, 646–647, 649
and facility type/size, 645–646
freight, 643, 648–650
hoistway, 642
hydraulic, 642–643, 647–649
lobbies, 642
machine rooms, 642
passenger, 643, 648
planning for, 643–645
traffic in, 650
types and uses, 642–643
Elliptical trainers, 829
Embankments, 931
Embedded flashing, 197
Embedment, retaining wall, 976
EMCS (energy management and control systems), 725–726
Emergency communications, 52
Emergency egress, 627, 644
Emergency fall protection, 470
Emergency lighting, 765, 766
Emergency power quick connects, 136
Emergency response, 127
Emergency showers, 681
Empathy, 1008–1009
Enclosures, 433, 536, 710. See also Exterior horizontal enclosures; Exterior vertical enclosures
End blocks, 186, 542
End islands, 943
End matching, 249
Endoscopy rooms, 809
End walls, 998
End-wall targets, swimming pool, 917
Energy analysis tools (BIM), 157
Energy codes, 755, 1001
Energy consumption:
and building shell, 314, 320–321
and lighting design, 755
and sustainability, 128
Energy-efficient glass, 568
Energy efficient walls, 88, 89, 281–283
Energy management and control systems (EMCS), 725–726
Energy performance ratings, glazing assemblies, 264
Engineered composite stone, 553
Engineered wood flooring, 593
Engine generators, 765–766
Entasis, 1012
Entertainment, equipment for, 821–833
athletic equipment, 827–833
instrumental equipment, 826–827
theater and stage equipment, 821–826
Entrances, signage for, 626
Entrance floor grids, 607
Entrance mats, 462
Entrance rooms, telecommunications, 768
Envelope components, 879, 895
Environment, 74–105
acoustics, 95–105
climate zones, 86–89
daylighting, 92–95
environmental factors, 74–79
solar radiation, 74–75
solar time, 78–79
Environmental impact, 128
EPDM roofing, 485
e-Plancheck, 158
Epoxy adhesives, 600
Epoxy ester paint, 565
Epoxy joints, stone panels with, 419
Epoxy mortar and grout, 597
Epoxy resin flooring, 606
Equipment, 780–835
accessible parking, 945
commercial, 785–816
entertainment and recreational, 821–833
institutional, 807–821
maintenance, 833–834
solid waste handling, 834–835
vehicular and pedestrian, 780–785
Equipment curb, 502, 515
Equipment rooms, 768, 815
Equipment supports, rooftop, 514–516
Ergonomics, 4
Erosion control, 924–925
Error-checking tools (BIM), 157
Escalators, 652
E studs, 534
Evacuated tubes, 704
Evacuation, 127
Evaporative condensers, 710
Evaporative space cooling, 90
Examination rooms, medical, 808
Excavations, basement, 931–936
lateral support for, 933–936
open-cut, 931
shored, 931–933
Exhaust hoods, 731, 797
Exit devices, 589
Exit lighting, 765
Expansion anchors, 419
Expansion, wood, 235
Expansion anchors, 255
Expansion control (expansion joints). See also Control joints in access flooring, 592
in building shell, 317–319
in horizontal waterproofing systems, 494
in masonry, 198–199
at parapets, 512–514
far stucco, 414
watershed concept for, 496
Expansion mullions, 490
Expansion screws, 562
Expansive soils, 278
Exposed aggregate, 177
Exposed concrete elevations, 166
Exposed mullion louvers, 435
Exposure, 182, 431
Express checkouts, 787
Extended detention wetlands, 929
Exterior (building):
climatic influence on, 314–315
removal/addition of classical elements, 1017
Exterior discharges, areas of refuge at, 645
Exterior domed fiberglass structures, 879–880
Exterior doors, 459–467
accessibility, 459
design considerations, 459
glass entrance, 460–461
hardware for, 461–467
installation of, 459
Exterior horizontal enclosures, 468–525
design considerations for roofs, 468–471
detailing for roofs, 500–516
roof coverings, 471–501
roof openings, 516–522
Exterior insulation and finish systems (EIFS), 412–413, 428–429
Exterior panels, plywood, 242
Exterior ramps, 953–954
Exterior stairs, 953, 954
Exterior vertical enclosures, 387–467
doors, 459–467
exterior insulation and finish systems (EIFS), 412–413, 428–429
Exterior windows, 438–459
in building shell, 438–447
detailing, 439
frame types, 442–443
glazing materials for, 441
installation of, 442–447
operation types, 440–441
performance of, 439
external frames, building modules with, 879–880
Exterior windows, 438–459
in building shell, 438–447
detailing, 439
frame types, 442–443
glazing materials for, 441
installation of, 442–447
operation types, 440–441
performance of, 439
External frames, building modules with, 879–880
External support, for excavations, 933–934
External venetian blinds, 437
Extinguishers, 637, 732–733, 741–743
Eyewash stations, 681
F
Fabric, awning and canopy, 524
Fabricated fireproofed steel columns, 341
Fabricated stone panels, 419, 420
Fabricated units, sound-conditioned, 885
Fabrication, metal, 211–212
Fabric edge clamps, 891
Fabric structures, 890–892
Fabric systems, 873–874
Filigree slabs, 337
Fill, 935, 987
Fillet joints, 317
Fillet welds, 228–231
Filtration:
of graywater, 992
of rainwater, 684–685
for swimming pools, 908, 909
Finger nozzles, 970
Finishes and finishing:
for ceilings, 611–618
concrete, 176–178, 300, 393, 399
for conference rooms, 853
for floors, 593–607
for GFRC walls, 402
for gybium board, 540, 561
of hardware, 584
interior, 546–566
for metals, 212–213
for panel products, 248
in patient care rooms, 808
for plaster, 561
for rainscreen panels, 411
for stairs, 609
for stone, 189, 598
for terrazzo, 603, 602
for wood, 234, 237, 239, 254
Fires, types of, 733, 743
Fire alarm control panels, 637, 638
Fire alarm pull stations, 742
Fire alarm systems, 56, 776
Fire and smoke detectors, 587
Fire and smoke vents, 522
Fire department connections (FDCs), 736–738
Fire detection systems, 56
Fire doors, 583
Fire extinguishers, 637, 732–733, 741–743
Fire extinguisher cabinets, 637
Fire hoses, 740–741
Fire hydrants, 1000
Fire-insulated file cabinets, 874
<table>
<thead>
<tr>
<th>Topic</th>
<th>Page Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fireplaces</td>
<td>627–637</td>
</tr>
<tr>
<td>Fireproof materials</td>
<td>341</td>
</tr>
<tr>
<td>Fire protection</td>
<td>120–121, 732–743</td>
</tr>
<tr>
<td>design considerations for</td>
<td>732–733</td>
</tr>
<tr>
<td>fire department connections</td>
<td>736–738</td>
</tr>
<tr>
<td>fire extinguishers</td>
<td>741–743</td>
</tr>
<tr>
<td>fire types</td>
<td>733</td>
</tr>
<tr>
<td>foam extinguishing systems</td>
<td>742</td>
</tr>
<tr>
<td>pumping systems</td>
<td>738–741</td>
</tr>
<tr>
<td>sprinklers</td>
<td>733–737</td>
</tr>
<tr>
<td>standpipes</td>
<td>736</td>
</tr>
<tr>
<td>Fire pumps</td>
<td>738–739</td>
</tr>
<tr>
<td>Fire-rated glass</td>
<td>569</td>
</tr>
<tr>
<td>Fire-rated joint covers</td>
<td>318</td>
</tr>
<tr>
<td>Fire ratings</td>
<td>470, 741, 742</td>
</tr>
<tr>
<td>Fire-resistance design</td>
<td>127</td>
</tr>
<tr>
<td>ceiling suspension systems</td>
<td>610</td>
</tr>
<tr>
<td>of interior partitions</td>
<td>528, 529</td>
</tr>
<tr>
<td>of linear metal ceilings</td>
<td>617</td>
</tr>
<tr>
<td>metal roof decking</td>
<td>350</td>
</tr>
<tr>
<td>openings</td>
<td>590</td>
</tr>
<tr>
<td>treatment of wood for</td>
<td>238–239</td>
</tr>
<tr>
<td>vaults</td>
<td>888</td>
</tr>
<tr>
<td>of wood</td>
<td>236</td>
</tr>
<tr>
<td>Fire-retardant paints</td>
<td>566</td>
</tr>
<tr>
<td>Fire-retardant particleboard cores</td>
<td>248</td>
</tr>
<tr>
<td>Fire-retardant treatment (FRT) wood</td>
<td>238–239</td>
</tr>
<tr>
<td>Fire safety</td>
<td>370, 637–638</td>
</tr>
<tr>
<td>Fire stairs</td>
<td>645</td>
</tr>
<tr>
<td>Fire suppression systems</td>
<td>127, 732–733</td>
</tr>
<tr>
<td>Fit, body</td>
<td>19</td>
</tr>
<tr>
<td>Fitness equipment</td>
<td>829–830</td>
</tr>
<tr>
<td>Fittings, pipe</td>
<td>671</td>
</tr>
<tr>
<td>Fixed air-foil acoustic blades</td>
<td>436</td>
</tr>
<tr>
<td>Fixed-arch anchorages</td>
<td>380</td>
</tr>
<tr>
<td>Fixed awnings</td>
<td>523</td>
</tr>
<tr>
<td>Fire safety</td>
<td>470, 741, 742</td>
</tr>
<tr>
<td>Fire protection</td>
<td>120–121, 732–743</td>
</tr>
<tr>
<td>design considerations for</td>
<td>732–733</td>
</tr>
<tr>
<td>fire department connections</td>
<td>736–738</td>
</tr>
<tr>
<td>fire extinguishers</td>
<td>741–743</td>
</tr>
<tr>
<td>fire types</td>
<td>733</td>
</tr>
<tr>
<td>foam extinguishing systems</td>
<td>742</td>
</tr>
<tr>
<td>pumping systems</td>
<td>738–741</td>
</tr>
<tr>
<td>sprinklers</td>
<td>733–737</td>
</tr>
<tr>
<td>standpipes</td>
<td>736</td>
</tr>
<tr>
<td>Fire pumps</td>
<td>738–739</td>
</tr>
<tr>
<td>Fire-rated glass</td>
<td>569</td>
</tr>
<tr>
<td>Fire-rated joint covers</td>
<td>318</td>
</tr>
<tr>
<td>Fire ratings</td>
<td>470, 741, 742</td>
</tr>
<tr>
<td>Fire-resistance design</td>
<td>127</td>
</tr>
<tr>
<td>ceiling suspension systems</td>
<td>610</td>
</tr>
<tr>
<td>of interior partitions</td>
<td>528, 529</td>
</tr>
<tr>
<td>of linear metal ceilings</td>
<td>617</td>
</tr>
<tr>
<td>metal roof decking</td>
<td>350</td>
</tr>
<tr>
<td>openings</td>
<td>590</td>
</tr>
<tr>
<td>treatment of wood for</td>
<td>238–239</td>
</tr>
<tr>
<td>vaults</td>
<td>888</td>
</tr>
<tr>
<td>of wood</td>
<td>236</td>
</tr>
<tr>
<td>Fire-retardant paints</td>
<td>566</td>
</tr>
<tr>
<td>Fire-retardant particleboard cores</td>
<td>248</td>
</tr>
<tr>
<td>Fire-retardant treatment (FRT) wood</td>
<td>238–239</td>
</tr>
<tr>
<td>Fire safety</td>
<td>370, 637–638</td>
</tr>
<tr>
<td>Fire stairs</td>
<td>645</td>
</tr>
<tr>
<td>Fire suppression systems</td>
<td>127, 732–733</td>
</tr>
<tr>
<td>Fit, body</td>
<td>19</td>
</tr>
<tr>
<td>Fitness equipment</td>
<td>829–830</td>
</tr>
<tr>
<td>Fittings, pipe</td>
<td>671</td>
</tr>
<tr>
<td>Fixed air-foil acoustic blades</td>
<td>436</td>
</tr>
<tr>
<td>Fixed-arch anchorages</td>
<td>380</td>
</tr>
<tr>
<td>Fixed awnings</td>
<td>523</td>
</tr>
<tr>
<td>Fire safety</td>
<td>470, 741, 742</td>
</tr>
<tr>
<td>Fire protection</td>
<td>120–121, 732–743</td>
</tr>
<tr>
<td>design considerations for</td>
<td>732–733</td>
</tr>
<tr>
<td>fire department connections</td>
<td>736–738</td>
</tr>
<tr>
<td>fire extinguishers</td>
<td>741–743</td>
</tr>
<tr>
<td>fire types</td>
<td>733</td>
</tr>
<tr>
<td>foam extinguishing systems</td>
<td>742</td>
</tr>
<tr>
<td>pumping systems</td>
<td>738–741</td>
</tr>
<tr>
<td>sprinklers</td>
<td>733–737</td>
</tr>
<tr>
<td>standpipes</td>
<td>736</td>
</tr>
<tr>
<td>Fire pumps</td>
<td>738–739</td>
</tr>
<tr>
<td>Fire-rated glass</td>
<td>569</td>
</tr>
<tr>
<td>Fire-rated joint covers</td>
<td>318</td>
</tr>
<tr>
<td>Fire ratings</td>
<td>470, 741, 742</td>
</tr>
<tr>
<td>Fire-resistance design</td>
<td>127</td>
</tr>
<tr>
<td>ceiling suspension systems</td>
<td>610</td>
</tr>
<tr>
<td>of interior partitions</td>
<td>528, 529</td>
</tr>
<tr>
<td>of linear metal ceilings</td>
<td>617</td>
</tr>
<tr>
<td>metal roof decking</td>
<td>350</td>
</tr>
<tr>
<td>openings</td>
<td>590</td>
</tr>
<tr>
<td>treatment of wood for</td>
<td>238–239</td>
</tr>
<tr>
<td>vaults</td>
<td>888</td>
</tr>
<tr>
<td>of wood</td>
<td>236</td>
</tr>
<tr>
<td>Fire-retardant paints</td>
<td>566</td>
</tr>
<tr>
<td>Fire-retardant particleboard cores</td>
<td>248</td>
</tr>
<tr>
<td>Fire-retardant treatment (FRT) wood</td>
<td>238–239</td>
</tr>
<tr>
<td>Fire safety</td>
<td>370, 637–638</td>
</tr>
<tr>
<td>Fire stairs</td>
<td>645</td>
</tr>
<tr>
<td>Fire suppression systems</td>
<td>127, 732–733</td>
</tr>
<tr>
<td>Fit, body</td>
<td>19</td>
</tr>
<tr>
<td>Fitness equipment</td>
<td>829–830</td>
</tr>
<tr>
<td>Fittings, pipe</td>
<td>671</td>
</tr>
<tr>
<td>Fixed air-foil acoustic blades</td>
<td>436</td>
</tr>
<tr>
<td>Fixed-arch anchorages</td>
<td>380</td>
</tr>
<tr>
<td>Fixed awnings</td>
<td>523</td>
</tr>
<tr>
<td>Fire safety</td>
<td>470, 741, 742</td>
</tr>
<tr>
<td>Fire protection</td>
<td>120–121, 732–743</td>
</tr>
<tr>
<td>design considerations for</td>
<td>732–733</td>
</tr>
<tr>
<td>fire department connections</td>
<td>736–738</td>
</tr>
<tr>
<td>fire extinguishers</td>
<td>741–743</td>
</tr>
<tr>
<td>fire types</td>
<td>733</td>
</tr>
<tr>
<td>foam extinguishing systems</td>
<td>742</td>
</tr>
<tr>
<td>pumping systems</td>
<td>738–741</td>
</tr>
<tr>
<td>sprinklers</td>
<td>733–737</td>
</tr>
<tr>
<td>standpipes</td>
<td>736</td>
</tr>
<tr>
<td>Fire pumps</td>
<td>738–739</td>
</tr>
<tr>
<td>Fire-rated glass</td>
<td>569</td>
</tr>
<tr>
<td>Fire-rated joint covers</td>
<td>318</td>
</tr>
<tr>
<td>Fire ratings</td>
<td>470, 741, 742</td>
</tr>
<tr>
<td>Fire-resistance design</td>
<td>127</td>
</tr>
<tr>
<td>ceiling suspension systems</td>
<td>610</td>
</tr>
<tr>
<td>of interior partitions</td>
<td>528, 529</td>
</tr>
<tr>
<td>of linear metal ceilings</td>
<td>617</td>
</tr>
<tr>
<td>metal roof decking</td>
<td>350</td>
</tr>
<tr>
<td>openings</td>
<td>590</td>
</tr>
<tr>
<td>treatment of wood for</td>
<td>238–239</td>
</tr>
<tr>
<td>vaults</td>
<td>888</td>
</tr>
<tr>
<td>of wood</td>
<td>236</td>
</tr>
</tbody>
</table>
Footings:
- concrete, 164–166
- connections of exterior walls and, 393, 395
dowel and keyway requirements for, 289
- pole construction, 368
- for shallow foundations, 285–286
- waterproofing at, 311
- for wood decks, 373

Forced-air units, 698

Forced entry, resistance to, 126

Forces:
- on retaining walls, 972
- seismic, 118–119, 363
- thermal, 78
- wind, 78, 363, 470, 984

Ford Elementary School, 21

Forest certification, 236

Formed concrete pool walls, 910

Formed footings, 165

Formed glass, 568

Formed sheet metal roofing, 499

Form liners, 177–178

Form ties, 168

Formwork, concrete, 164–169
- accessories for, 168–169
- for columns and footings, 165–166
- components, 164–165
- general, 164
- insulating concrete forms, 384
- precast permanent, 401
- for slabs and beams, 167–168
- for walls, 166–167

Foundations, 283–298
- climatic foundation issues, 279–283
- drainage from, 302
- dual-line expansion joint termination at, 319
- EIFS rainscreen wall at, 413
- flood-resistant, 120
- floor joists bearing on, 394
- insulation for, 312
- for masonry fireplaces, 631
- reinforcement of, 292
- seismic base isolation for, 297–298
- settlement of, 283–284
- shallow, 285–289
- spaced beams at, 368
- special, 293–297
- standard, 284
- stone spandrels at, 419
- underpinnings for, 285–289
- Foundation drainage piping, 993
- Fountains, 966–971
- 4Rs of building resilience, 109–110
- 400 meter track, 964

Four-pipe fan-coil systems, 718

Four-sided structural silicon glazing, 455

Frames and framing. See also Cold-formed steel framing; Metal framing; Structural framing; Wood framing
- for awnings, 522–524
- of building modules, 878–880
- for ceilings, 614
- concrete, 334–336, 901
- for crawl spaces, 304
- for doors, 208
- for exterior walls, 347
- face frames, 839–840
- for floors, 342–344, 356–361
- of glazed panels, 544
- gypsum board, 559
- for interior doors, 571, 573, 575–577
- for interior partitions, 528–533
- for joists and sills, 358–361
- for metal building systems, 896
- moment-resisting frames, 340
- for openings, 347–349, 361–363
- platform, 357–358
- ring frames, 831
- for roofs, 349–350, 374–382
- for skylights, 517–520
- space frames, 345–347, 880–881, 893
- subhearth air frames, 631
- for windows, 442–444

Freestanding bathtubs, 678

Freestanding concrete stairs, 339

Freestanding furniture systems, 869–871

Freestanding garden walls, 976–981

Freestanding garden walls, 976–981

Freestanding furniture systems, 869–871

Freestanding garden walls, 976–981

Freestanding objects, 46

Freestanding safes, 804

Freeze protection, 705

Freezer, 817, 820

Freight elevators, 643, 648–650

Frequency, 95

Frit glass, 262, 569

Furnaces, 703, 704, 711, 712

Furnishings, 836–876
- fixed, 836–849
- movable, 849–876

Gardens, 46

Garden walls, freestanding, 976–981

Gas appliances, 634–636, 702

Gas-based systems, fire protection, 732

Gas burning fireplaces, 634–635

Gas-fired heaters, 696–698, 702

Gas trains, 702

Gates, pedestrian security, 785, 786

Gate valves, 672–673

General acute care rooms, 807

General Services Administration (GSA), 899

Generators, engine, 765–766

Geothermal investigations, 275

Geyser nozzles, 970

GF CI (ground-fault circuit interrupter) receptacles, 754

Girders, 335, 370

Glare control, 517, 755

Glare protection, 984

Glass, 260–269
- in athletic rooms, 919
- for daylighting, 95
- for entrance doors, 460–461
- flooring, 385, 387
- glazing materials in window units, 626–269
- for interior windows, 566–569
- piping, 670
- product types, 260–263
- and solar gain, 263–265
- standards, 260
- in storefront systems, 449
- supports for long-span curtain wall, 458
- thermal resistance values of glazing, 263

Function, building, 130

Functional planning, 1–72
- accessible design, 39–41
- human factors, 4–18
- technical criteria, 42–77
- universal design, 19–38

Four-pipe fan-coil systems, 718

Furnaces, 703, 704, 711, 712

Furnishings, 836–876
- fixed, 836–849
- movable, 849–876

Furring, 414, 537, 559, 615

Fuses, 752

Fused glass, 568, 569

Gable roofs, 246, 274, 382, 387

Galean corrosion potential, 197

Galvanic series, 211

Gambrel roofs, 211

Garden walls, freestanding, 976–981

Gas appliances, 634–636, 702

Gas-based systems, fire protection, 732

Gas burning fireplaces, 634–635

Gas-fired heaters, 696–698, 702

Gaskets, skylight, 517

Gas trains, 702

Gates, pedestrian security, 785, 786

Gate valves, 672–673

General acute care rooms, 807

General Services Administration (GSA), 899

Generators, engine, 765–766

Geotechnical investigations, 275

Geyser nozzles, 970

GF CI (ground-fault circuit interrupter) receptacles, 754

Girders, 335, 370

Glare control, 517, 755

Glare protection, 984

Glass, 260–269
- in athletic rooms, 919
- for daylighting, 95
- for entrance doors, 460–461
- flooring, 385, 387
- glazing materials in window units, 626–269
- for interior windows, 566–569
- piping, 670
- product types, 260–263
- and solar gain, 263–265
- standards, 260
- in storefront systems, 449
- supports for long-span curtain wall, 458
- thermal resistance values of glazing, 263
Glass canopies, 525
Glass doors, 582–583
Glass fiber-reinforced concrete (GFRC), 401–402
Glass fiber-reinforced gypsum (GFRG), 617–618
Glass-reinforced gypsum (GRG), 639
Glass-sheathed greenhouses, 894
Glass stops, 581
Glass unit masonry, 185–186
block types for, 186
for exterior walls, 410–411
installation of, 206–208
for interior partitions, 541–542
mortar, 185
Glass washers, 803
Glazed curtain walls, 447–450
Glazed structures, 893–897
Glazing:
of ceramic tile, 551, 596
of curtain walls, 454, 455
dry, 268, 453
of interior doors, 581
of interior partitions, 542–544
of interior windows, 568–570
for skylights, 517, 518
sloped, 346
in storefront systems, 449–450
thermal resistance values of, 263
of window units, 265–269, 441
Globe valves, 673
Glue chip glass, 569
Glued floor systems, 246
Glued-laminated construction, 370, 379–382
Goosenecks, 698
Grab bars:
in bathrooms, 62, 68, 623
in pools, 913, 916, 917
Grade:
curtain walls at, 456
foundations at, 286
for interior doors, 573, 575
in parking lots, 944
of resilient wood flooring, 595
Grade beams, 287
Grading (situwork), 924, 936–937, 987–988
Grading, of wood and wood products, 235, 240
Grand acoustic pianos, 826
Granite, 187, 189, 552, 599
Graphic standards, 1007
Graphic symbols, 143
Grass paving, 952
Grates and gratings:
floor, 606–607
metal, 222–223
storm drainage, 997–998
Gravel pads, 87, 280
Gravel stops, 512
Gravitational loads, 115
Gravity-held panel systems, 591
Gravity retaining walls, 974
Graywater systems, 665–688
Graywater wastewater management, 991–992
Grease interceptors (grease traps), 669
Greenhouses, 893–894
Greenstone, 552
Greiner Hall, State of New York University (Buffalo, New York), 31–33
Grid-connected photovoltaic systems, 763, 764
Griddles (grills), 800
Grid systems, curtain wall, 454
Grills (griddles), 800
Grilles, 463, 464, 606–607, 722
Grillwork installation, 225
Groove welds, 228–231
Ground-coupled water loop heat pump, 720–721
Ground cover plantings, 984–986
Ground-fault circuit interrupter (GFCI) receptacles, 754
Ground freezing, 934
Ground grids, 766
Grounding, wall shield, 905
Ground motion data recording, 899
Ground-mounted air structures, 892
Ground surface, accessible route, 45
Group number, plywood, 240–241
Grout and grouting:
ASTM specifications for, 191
for ceramic tile, 597
materials in, 192–193
recommended types, 192
for reinforcing foundations, 292
for stone panels, 555
Grouted thread bar anchorage, 334
GSA (General Services Administration), 899
Guards, tree, 990
Guards, 504–506, 521
Gutter inlet storm drainage structures, 999
Gymnastics equipment, 830–831
Hangers:
concrete formwork, 168
gutter, 505
isolation, 612
piping, 674
plaster, 564, 613
stair, 535
Hanging garment conveyors, 794, 795
Hardboard panel cores, 248
Hardened utility risers, 124
Hard material support, piping, 674
Hard-surface floor maintenance equipment, 834
Hardware, door, 461–467, 583–589
Hardwood, 236, 248
Harmony, 1008
Hatches, 521, 590
Hazard-specific building resilience, 113–114
HDD (Heating Degree Days), 91
Headboards, 860
Heads, 521, 590
Headwalls, 808, 998
Healthcare facilities, 69, 692
Hearing testing (audiology) spaces, 808
Hearth (masonry fireplaces), 630, 631
sheathing, 244
stone panels on, 554
Gypsum lath, 563
H
Hair interceptors, 669
Hair styling stations, 795
Halogen incandescent lamps, 758
Halon alternatives, 732
HAM, see Heat, air, and moisture
Handing capabilities, elevator, 645
Handrails:
with bumper cushions, 620
for ramps, 50, 620
in shaft walls, 535
for stairs, 350, 954
for swimming pools, 912
Hangers:
concrete formwork, 168
gutter, 505
isolation, 612
piping, 674
plaster, 564, 613
stair, 535
Hanging garment conveyors, 794, 795
Hardboard panel cores, 248
Hardened utility risers, 124
Hard material support, piping, 674
Hard-surface floor maintenance equipment, 834
Hardware, door, 461–467, 583–589
Hardwood, 236, 248
Harmony, 1008
Hatches, 521, 590
Hazard-specific building resilience, 113–114
HDD (Heating Degree Days), 91
Headboards, 860
Heads:
curtain wall, 455
EIFS rainscreen wall, 412
metal framing for, 348
in shaft walls, 534
stone, 423
stone spandrels at, 419
storefront, 450
window, 444–446
Headroom, for sectional doors, 466
Heads, sprinkler, 733–734
Headwalls, 808, 998
Healthcare facilities, 69, 692
Hearing testing (audiology) spaces, 808
Hearth (masonry fireplaces), 630, 631
Heat:
of lighting, 755
solar position and, 82–85
Heat, air, and moisture (HAM):
for clay masonry walls, 405–406
and climate, 315
for CMU walls, 402, 403
controlling, 315–316
with EIFS systems, 429
for GFRC walls, 402
for insulated metal panel walls, 425
for metal cladding panels, 427
for panelized wall cladding, 423
for precast concrete walls, 399
for rainscreen panels, 411
for stone panel walls, 420
for stucco walls, 413
for tilt-up concrete walls, 393
Heat-absorbing glass, 260, 261
Heaters, 887, 909
Heat exchangers, 731
Heat-fused joints, 672
Heat generation, 699–707
boilers, 699–700
breechings, chimneys, and stacks, 700–701
condensing furnaces, 703
gas-fired equipment, 702–703
solar systems, 703–707
Heating, ventilating, and air-conditioning (HVAC), 691–731
in athletic rooms, 919
control systems for, 725–731
delivery components, 722–725
design considerations for, 691–694
distribution arrangements and components, 711–721
heat generation components, 699–707
penetrations of radiation shielded rooms for, 902
refrigeration components, 707–711
source components, 699–711
system types, 694–699
Heating Degree Days (HDD), 91
Heat loss, in windows, 264
Heat pipes, 730
Heat pumps, 708, 719–721, 731
Heat-recovery systems, 730–731
Heat rejection methods, 729
Heat-strengthened glass, 567
Heat-treated glass, 260
Heavy fixture attachment, framing for, 348
Heavy timber construction, 234, 382
exterior walls in, 429–430
framing for, 365–366
Heavy vehicular paving bricks, 948
He-bolts, 169
Hedges, stone, 980
Helical anchors, 296
Helical inserts, 257
Helicoidal concrete stairs, 340
Hems, canopy and awning, 523
Hidden classical architecture elements, 1016–1017
HID (high-intensity discharge) lamps, 758–759
High chairs, 861
High-density shelving, 872
Higher order dependencies, 134, 135
High-impact areas, flooring for, 607
High-intensity discharge (HID) lamps, 758–759
High-performance louver blades, 437
High-pressure sodium (HPS) lamps, 759
High-rase fan-coil units, 723
High schools, 863, 959–960, 962
Hinges, 586–587, 840–841
Hinged gratings, 223
Hinge pins, 586
Hip roofs, 374
Hockey, 831–832, 920–921
Hoistways, 642, 646
Hold-down clips, 612
Holders, door, 585, 587
Holed hydraulic elevators, 647–648
Hollow-core doors, 579
Hollow metal doors, 574–576
Hollow wall anchors, 255
Hoods:
  exhaust, 731, 797
  fume, 816
  vent, 819, 820
Hook-and-pin panels, 427
Horizontal bars, 831
Horizontal enclosures, see Exterior horizontal enclosures
Horizontal expansion control, 317–318
Horizontal storm drainage piping, 683
Horizontal waterproofing, 493–495
Hoses, fire-suppression, 740–741
Hose bibbs, 679
Hydrated lime, 192
Hydraulic elevators, 642–643, 647–649
Hydopneumatic tank system, 663
Hydrotherapy baths, 908, 909
Hydrotherapy rooms, 796

Ice chests, 803
Ice cream cabinets, 802
Ice hockey, 831–832, 920–921
Ice machines, 817
Ice rinks, 919–922
Ice wedges, 86, 279
ICFs (insulating concrete forms), 384
ICS (Integrated collector-storage), 705
ICU (intensive care unit), 807–808
Identification signage, 624
Identity symbols, 143
IFC (Industry Foundation Class) model, 157–159
IfcWall, 158
I-Joists, 359, 364, 375–376
Illuminance, 756–757, 760
Imaging rooms, 809
Impact loads, 330
Impact noise, 98–99
Incandescent lamps, 758
Inclined ladders, 353
Inclined wheelchair lifts, 53–54
Increased-privacy compartments, 621
Index of refraction, 1022
Indicator valves, 1000
Indirect ambient lighting, 755
Induced draft, 703, 709
Induced-draft cooling towers, 709
Induction air distribution, 717
Induction lamps, 759
Induction units, 723
Industrial-grade particleboard cores, 247
Industrial wood block flooring, 595
Industry Foundation Class (IFC) model, 157–159
Industry standards, glass, 260
Inert gases system, 732
Infants, anthropometric data for, 4–5
Infill wood studs, 429
<table>
<thead>
<tr>
<th>Topic</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrared heating units</td>
<td>698</td>
</tr>
<tr>
<td>Ingredient bins, rolling</td>
<td>801</td>
</tr>
<tr>
<td>Inlets</td>
<td>999–1000</td>
</tr>
<tr>
<td>Insect damage, in wood</td>
<td>236</td>
</tr>
<tr>
<td>Inserts, glass block</td>
<td>186</td>
</tr>
<tr>
<td>Insert flushing</td>
<td>509</td>
</tr>
<tr>
<td>Installation:</td>
<td></td>
</tr>
<tr>
<td>- of carpet</td>
<td>603–604</td>
</tr>
<tr>
<td>- of ceramic tile</td>
<td>551</td>
</tr>
<tr>
<td>- of composites, 252–258</td>
<td></td>
</tr>
<tr>
<td>- of curtain walls</td>
<td>451</td>
</tr>
<tr>
<td>- of elevators</td>
<td>643, 644</td>
</tr>
<tr>
<td>- of exterior doors</td>
<td>459, 464</td>
</tr>
<tr>
<td>- of fire-suppression equipment cabinet</td>
<td>742</td>
</tr>
<tr>
<td>- of flooring</td>
<td>593–594, 597–598</td>
</tr>
<tr>
<td>- of glass doors</td>
<td>582</td>
</tr>
<tr>
<td>- of masonry</td>
<td>199–208</td>
</tr>
<tr>
<td>- of metal</td>
<td>228–231, 350</td>
</tr>
<tr>
<td>- of non-suspended ceilings</td>
<td>300</td>
</tr>
<tr>
<td>- of piping insulation</td>
<td>674</td>
</tr>
<tr>
<td>- of plastics</td>
<td>252–258</td>
</tr>
<tr>
<td>- of roofing</td>
<td>473</td>
</tr>
<tr>
<td>- of stone</td>
<td>553–556, 597–598</td>
</tr>
<tr>
<td>- of sump pumps</td>
<td>670</td>
</tr>
<tr>
<td>- of windows</td>
<td>493–447</td>
</tr>
<tr>
<td>- of window glazing</td>
<td>268</td>
</tr>
<tr>
<td>- of wood</td>
<td>252–258</td>
</tr>
<tr>
<td>Instantaneous-type water heaters</td>
<td>668</td>
</tr>
<tr>
<td>Institutional equipment</td>
<td>807–821</td>
</tr>
<tr>
<td>- audio-visual</td>
<td>810–816</td>
</tr>
<tr>
<td>- laboratory</td>
<td>816–817</td>
</tr>
<tr>
<td>- library</td>
<td>810</td>
</tr>
<tr>
<td>- medical</td>
<td>807–810</td>
</tr>
<tr>
<td>- residential</td>
<td>817–821</td>
</tr>
<tr>
<td>Instrumental equipment</td>
<td>826–827</td>
</tr>
<tr>
<td>Insulated metal panel wall assemblies</td>
<td>424–425</td>
</tr>
<tr>
<td>Insulating concrete forms (ICFs)</td>
<td>384</td>
</tr>
<tr>
<td>Insulating glass</td>
<td>260–261, 268, 568</td>
</tr>
<tr>
<td>Insulation:</td>
<td></td>
</tr>
<tr>
<td>- for basement walls</td>
<td>312</td>
</tr>
<tr>
<td>- board</td>
<td>414, 431</td>
</tr>
<tr>
<td>- in crawl spaces</td>
<td>303</td>
</tr>
<tr>
<td>- for ducts</td>
<td>721</td>
</tr>
<tr>
<td>- in EIFS systems</td>
<td>428</td>
</tr>
<tr>
<td>- and horizontal waterproofing</td>
<td>494</td>
</tr>
<tr>
<td>- for piping</td>
<td>673–674</td>
</tr>
<tr>
<td>- rigid insulation sheathing</td>
<td>245</td>
</tr>
<tr>
<td>- roofs</td>
<td>469</td>
</tr>
<tr>
<td>Insulators, acoustic</td>
<td>616</td>
</tr>
<tr>
<td>Insurance coverage</td>
<td>470</td>
</tr>
<tr>
<td>Integrally colored cement</td>
<td>178</td>
</tr>
<tr>
<td>Integrated collector-storage (ICS), 705</td>
<td></td>
</tr>
<tr>
<td>Integrated construction</td>
<td>878</td>
</tr>
<tr>
<td>Integrated frame building modules</td>
<td>878–879</td>
</tr>
<tr>
<td>Integrity, structural</td>
<td>127</td>
</tr>
<tr>
<td>Intelligibility</td>
<td>813–814</td>
</tr>
<tr>
<td>Intensive care unit (ICU)</td>
<td>807–808</td>
</tr>
<tr>
<td>Interactive fountains</td>
<td>968</td>
</tr>
<tr>
<td>Interceptors, sanitary waste</td>
<td>668–670</td>
</tr>
<tr>
<td>Intercolulation</td>
<td>1013</td>
</tr>
<tr>
<td>Interfaces</td>
<td>642, 650, 756</td>
</tr>
<tr>
<td>Interference body bolts</td>
<td>256</td>
</tr>
<tr>
<td>Interior (building):</td>
<td></td>
</tr>
<tr>
<td>- climatic influence on</td>
<td>315–316</td>
</tr>
<tr>
<td>- construction of</td>
<td>528–639</td>
</tr>
<tr>
<td>- construction tolerances for connections</td>
<td>208</td>
</tr>
<tr>
<td>- of lightweight mobile modular buildings</td>
<td>879</td>
</tr>
<tr>
<td>- for metal building systems</td>
<td>895</td>
</tr>
<tr>
<td>- removal of classical elements</td>
<td>1017</td>
</tr>
<tr>
<td>Interior construction</td>
<td>528–639</td>
</tr>
<tr>
<td>- ceilings</td>
<td>609–618</td>
</tr>
<tr>
<td>- column covers</td>
<td>639</td>
</tr>
<tr>
<td>- doors</td>
<td>570–590</td>
</tr>
<tr>
<td>- finishes</td>
<td>546–566</td>
</tr>
<tr>
<td>- fireplaces and stoves</td>
<td>627–637</td>
</tr>
<tr>
<td>- fire safety equipment</td>
<td>637–638</td>
</tr>
<tr>
<td>- floors</td>
<td>590–609</td>
</tr>
<tr>
<td>- partitions</td>
<td>528–546</td>
</tr>
<tr>
<td>- of performance theaters and rehearsal halls</td>
<td>103</td>
</tr>
<tr>
<td>- railings</td>
<td>618–619</td>
</tr>
<tr>
<td>- signage</td>
<td>616–627</td>
</tr>
<tr>
<td>- specialty components</td>
<td>618–639</td>
</tr>
<tr>
<td>- storage</td>
<td>638–639</td>
</tr>
<tr>
<td>- toilet compartments and accessories</td>
<td>621–624</td>
</tr>
<tr>
<td>- wall and door protection</td>
<td>620–621</td>
</tr>
<tr>
<td>- windows and glazing</td>
<td>566–570</td>
</tr>
<tr>
<td>Interior detection systems</td>
<td>777</td>
</tr>
<tr>
<td>Interior doors, 570–583</td>
<td></td>
</tr>
<tr>
<td>- for access panels</td>
<td>548–549, 589–590</td>
</tr>
<tr>
<td>- design considerations for</td>
<td>578–583</td>
</tr>
<tr>
<td>- hardware for</td>
<td>583–589</td>
</tr>
<tr>
<td>- radio frequency shielding for</td>
<td>904</td>
</tr>
<tr>
<td>- terminology for</td>
<td>570–571</td>
</tr>
<tr>
<td>- types of</td>
<td>572–578</td>
</tr>
<tr>
<td>Interior finishes</td>
<td>546–566</td>
</tr>
<tr>
<td>- ceramic tile</td>
<td>551–552</td>
</tr>
<tr>
<td>- gypsum board</td>
<td>556–561</td>
</tr>
<tr>
<td>- plaster</td>
<td>561–564</td>
</tr>
<tr>
<td>- stone wall panels</td>
<td>552–556</td>
</tr>
<tr>
<td>- wall coverings</td>
<td>564–566</td>
</tr>
<tr>
<td>- wood</td>
<td>546–550</td>
</tr>
<tr>
<td>Interior foundation walls</td>
<td>288, 289</td>
</tr>
<tr>
<td>Interior landscaping</td>
<td>875–876</td>
</tr>
<tr>
<td>Interior offices</td>
<td>849</td>
</tr>
<tr>
<td>Interior panels</td>
<td>243</td>
</tr>
<tr>
<td>Interior partitions</td>
<td>528–546</td>
</tr>
<tr>
<td>- concrete masonry units</td>
<td>538–541</td>
</tr>
<tr>
<td>- glazed unit masonry assemblies</td>
<td>541–542</td>
</tr>
<tr>
<td>- glazed partitions</td>
<td>542–544</td>
</tr>
<tr>
<td>- gypsum board assemblies</td>
<td>528, 532–533</td>
</tr>
<tr>
<td>- metal stud framing systems</td>
<td>529–533</td>
</tr>
<tr>
<td>- operable panel partitions</td>
<td>545–546</td>
</tr>
<tr>
<td>- protection for</td>
<td>620–621</td>
</tr>
<tr>
<td>- shaft wall assemblies</td>
<td>533–537</td>
</tr>
<tr>
<td>- wood stud framing systems</td>
<td>528–533</td>
</tr>
<tr>
<td>Interior ramps</td>
<td>953</td>
</tr>
<tr>
<td>Interior stairs</td>
<td>953</td>
</tr>
<tr>
<td>Interior windows</td>
<td>566–570</td>
</tr>
<tr>
<td>- applied films</td>
<td>569</td>
</tr>
<tr>
<td>- cutting and edge treatments</td>
<td>570</td>
</tr>
<tr>
<td>- glass</td>
<td>566–569</td>
</tr>
<tr>
<td>- glazing</td>
<td>570</td>
</tr>
<tr>
<td>- mirrors</td>
<td>569</td>
</tr>
<tr>
<td>- surface textures</td>
<td>569</td>
</tr>
<tr>
<td>- Interior woodwork</td>
<td>239</td>
</tr>
<tr>
<td>- Interlocking pavers</td>
<td>951</td>
</tr>
<tr>
<td>- Interimmitent fillet welds</td>
<td>231</td>
</tr>
<tr>
<td>- Internal reflection</td>
<td>1022</td>
</tr>
<tr>
<td>- Internal shelters</td>
<td>116–117</td>
</tr>
<tr>
<td>- Internal support, for excavations</td>
<td>933</td>
</tr>
<tr>
<td>- Interoperability</td>
<td>157</td>
</tr>
<tr>
<td>- Intersecting members, metal detailing</td>
<td>224</td>
</tr>
<tr>
<td>- Intersections</td>
<td>20, 348, 375</td>
</tr>
<tr>
<td>- Intumescent paints</td>
<td>565–566</td>
</tr>
<tr>
<td>- Ionic order</td>
<td>1011</td>
</tr>
<tr>
<td>- Iron</td>
<td>210, 224</td>
</tr>
<tr>
<td>- Irradiation, solar</td>
<td>82–85</td>
</tr>
<tr>
<td>- Irrigation</td>
<td>686, 981–984, 992</td>
</tr>
<tr>
<td>- Isolated (sound-conditioned) rooms</td>
<td>884–885</td>
</tr>
<tr>
<td>- Isolation clips</td>
<td>899</td>
</tr>
<tr>
<td>- Isolation hangers</td>
<td>612</td>
</tr>
<tr>
<td>- Isolation joints</td>
<td>300</td>
</tr>
<tr>
<td>- Isolators</td>
<td>885</td>
</tr>
<tr>
<td>J</td>
<td></td>
</tr>
<tr>
<td>Jackets, piping</td>
<td>674</td>
</tr>
<tr>
<td>Jack rafters</td>
<td>374</td>
</tr>
<tr>
<td>Jamb(s):</td>
<td></td>
</tr>
<tr>
<td>- door</td>
<td>348, 459, 462, 463</td>
</tr>
<tr>
<td>- EIFS rainscreen walls at</td>
<td>413</td>
</tr>
<tr>
<td>- of metal building systems</td>
<td>897</td>
</tr>
<tr>
<td>- window</td>
<td>444, 445</td>
</tr>
<tr>
<td>- Jamb struts</td>
<td>533</td>
</tr>
<tr>
<td>- Janitor carts</td>
<td>634</td>
</tr>
<tr>
<td>- Janitorial closets</td>
<td>833</td>
</tr>
<tr>
<td>- Jet grouting</td>
<td>292</td>
</tr>
<tr>
<td>- Johnson, Philip</td>
<td>1007</td>
</tr>
<tr>
<td>Joints:</td>
<td></td>
</tr>
<tr>
<td>- in clay masonry</td>
<td>409</td>
</tr>
<tr>
<td>- in concrete slabs</td>
<td>299–301</td>
</tr>
</tbody>
</table>
Joints, (continued)
in concrete walls, 399
dry spline, 426
in EIFS systems, 411, 412, 428–429
formwork, 164, 176–178
in GFRC walls, 402
GRG finishing for, 639
in heavy timber construction, 366
in horizontal waterproofing systems, 494, 495
interior finishes at, 566
masonry panel, 424
mortar and grout at, 193, 194
movement, 198–199, 566, 597, 601
movement of water across, 392
in piping, 671–672
in plaster, 562
prequalification of, 230
reinforcement of, 196
in retaining walls, 974, 975
in siding, 415–417
slip, 532
in stone floors, 601
in stone masonry, 190–191
in stone panels, 419, 420, 555
in stucco, 562
in wood, 235, 373, 549
Joint tapes, 560, 561
Joists:
ceiling, 375
floor, 385, 386
heavy timber, 429
skip, 332
steel, 247, 342–344, 382
wood, 358–361, 364
Joist slabs, 332
J-runners, 533
Judo, equipment for, 832
Junior high school classrooms, 862
K
Karate, equipment for, 832
KEE roofing, 485
Kennels, 918–919
Kerfed-edge acoustic ceiling tile, 611
Keyboards, 826
Keyed construction joints, 177
Keyway requirements, 289
Kieran Timberlake Associates (KTA), 152
Kindergarten classrooms, 861, 862
Kingposts, 378
Kiosks, 788
Kitchens:
accessible, 63–66
design considerations, 817
equipment in, 817–820
exhaust from, 731
fire-extinguishing systems for, 733
layouts for, 818
lighting in, 22
Knee clearances, 42, 64, 838
Knee walls, 308
Knitted carpet, 603
Knockdown frame, 575
Koning Eizenberg Architecture, 19
KTA (Kieran Timberlake Associates), 152
L
Laboratories, 816–817, 841–842
Lacrosse fields, 963
Lactation room, 22
Ladders, 352–354, 916–917
Lag bolts, 255
Lamina, EIFS system, 428
Laminates, for panel products, 248
Laminated countertops, solid-wood, 843
Laminated decking, 373
Laminated glass, 261, 567
Lamps, 757–759
Lamp color stability, 756
Lamp life, 755, 758
Lamp lumen degradation (LLD), 756
Lamp replacement schedule, 755
Landings, 50, 51, 953, 954
Landscaping, 981–981
construction around existing trees, 986–988
irrigation system for, 981–984
movable furnishings, 875–876
rooftop plantings, 991–992
tree planting in urban areas, 988–991
trees, plants, and ground covers, 984–986
urban tree rooting, 981
LANs (local area networks), 772
Lap joints, 317, 366
Lap siding, 415
Lateral bracing attachments, 347
Lateral file cabinets, 874
Lateral loads, 115
Lateral support, for excavations, 933–936
Latex-modified portland cement mortar, 600
Latex paint, 565
Latex resin flooring, 606
Lath, 413, 562–564, 613, 614
Laundry chutes, 659
Laundry facilities, 796–797, 821
Lavatories, 676–678
accessibility of, 57
adjustable-height, 19
mounting heights, 680
supports for, 681
Lawns, 990
Law of reflection, 1022
Law of refraction, 1022
Laws, defined, 39
LCM Architects, 28
Lead, 210, 900–902, 905
Leaded stained glass, 567
Lead-lined block in concrete frame construction, 901
Lead sheet in wood construction, 901
Leaf screens, 694
Leakage, water, 433
Learning spaces, 863
Leasing, of interior landscapes, 875
LECs (local equipment controllers), 725
Lecture halls, 103, 845–846
Lecture-style classroom arrangements, 864
LED (light-emitting diode) lamps, 759
LEED credits, 984
Legislative process, accessible design, 39
Legitimate activity, 136
Level, changes in, 45
Level bearing, thresholds with, 461
Libraries, 810, 867–868
Lifecycle, 128, 139
Life safety/security infrastructure, 132–134
Lifts:
pool, 912
wheelchair, 53–54, 651
Lift clearance, 466
Lift crash gates, 782
Lifting capacity, 912
Lift-plate barricades, 782
Light, speed of, 1022
Light-emitting diode (LED) lamps, 759
Lighting, 754–761
in athletic rooms, 919
in conference rooms, 853
controls for, 760
design considerations for, 754–756
exit and emergency, 765, 766
for fountains, 968
illuminance, 756–757
interfaces for, 756
in kitchens, 22
lamps, 757–759
and light trespass/pollution, 761
luminaires, 759–760
of site, 1001–1003
terminality for, 754
Lighting fixtures, 611, 755
Lighting protection, 766–767
Lightning rods, 766
Light pollution, 761
Light reflectance (LR), 609–610
Light-traffic brick pavers, 948
Light transmission, 186
Light trespass, 761
Light trucks, 938
Lightweight mobile modular buildings, 879
Limestone, 187, 189
Limiting heights, for interior partitions, 530–531
Linear distance, 1021
Linear expansion coefficients, 1022
Linear metal ceilings, 616–617
Linear speed, 1021
Linen chutes, 659
Linen production, daily, 659
Liners, concrete form, 177–178
Line symbols, 146
Linoleum flooring, 604
Lintels, 199–200, 362, 421, 631
Lips, fountain, 967
Lippage, 555
Liquid desiccant systems, 728
Little League baseball fields, 956
Live loads, 330, 331
LLD (lamp lumen degradation), 756
Loads:
  cooling, 729, 755
electrical, 748
  on floors, 330, 331
  gravitational, 115
  impact, 330
  lateral, 115
  for lintels, 199
  live, 330, 331
  moment, 285
  for partitions, 528
  shear, 285
  static, 1025–1028
Lead-bearing walls and partitions:
  headers for, 348
  joist framing at, 343, 344
  rafters and, 381
  reinforcement for masonry, 405
  wood framing of floors at, 359
Loading docks, 780–781
Load plates, 300
Loam, 274
Lobbies, elevator, 51, 642–644
Lobby waiting times, 646
Loblolly residence (Taylors Island, Maryland), 152–157
Local area networks (LANs), 772
Local equipment controllers (LEC), 725
Local HVAC systems, 696–698
Locks, 499, 585
Lockers, 638
Locker rooms, 638
Logs, sawing, 235
Long-span structures, 320–321, 342, 457
Long-term performance, 113–114
Long-term resilience planning, 139
Loose-laid ballasted sheets, 485
Lounge chairs, 857
Lounge furniture, 857–858, 868
Louvers, 434–437, 698
Love seats, 857, 858
Low-emissivity coatings, 836
Low-emissivity glass, 568
Low-iron glass, 568
Low-pressure sodium (LPS) lamps, 759
Low slope roofs:
  characteristics and considerations with, 468–469
  coverings for, 477–499
  design of, 469–470
Low-voltage motor control centers, 746
Low-voltage screen controls, 775
LPS (low-pressure sodium) lamps, 759
LR (light reflectance), 609–610
LS steel shapes, 217
L-type retaining walls, 973
Lug sills, stone, 191
Lumber:
  grading of, 235
  as interior finish material, 234
  production of, 234–235
  thickness of, 235
  form, concrete, 165
  lumen maintenance, 758, 760
  method, 757
  luminaires, 757, 759–760
Mace, Ron, 19
Machine bolt anchors and shields, 254
Machine rooms, elevator, 642, 648
Machine screws, 256
Machine shaped decking, 373
Magnesium, 211
Magnesium oxychloride flooring, 605
Maintainability, 114–115
Maintenance, in CPTED, 136
Maintenance equipment, 833–834
Major League Baseball, 955–956
Maneuvering clearances, 42–44, 54–55
Manholes, 999–1001, 1003
Mansard roofs, 374
Manufactured concrete formwork, 164
Manufactured engineered structures, 893–897
Manufactured–fabricated rooms, 881–889
  clean rooms, 881–882
  cold storage rooms, 883–884
  paint booths, 888–889
  saunas, 885–887
  sound-conditioned rooms, 884–885
  steam baths, 887
  vaults, 887–888
Manufactured gas burning fireplaces, 634–635
Manufactured playground equipment, 972
Manufactured window units, 265–269, 441
Marble, 187–189, 552–553, 599
Marine-grade plywood, 241
Marsh systems, shallow, 927, 928
Masonry, 182–208
  accessories for, 197–198
  anchorage and reinforcing, 194–199
  basement walls, 305
  clay units, 182–183
  components of masonry work, 182–185
  concrete units, 184–185
  exterior walls, 402–411
  glass unit, 185–186
  installation guidelines and construction tolerances, 199–208
  interior doors in, 574
  lintels, 200
  for metal building systems, 896
  mortaring and grouting, 191–194
  securing cap flashing to, 508
  stone assemblies, 187–190
  stone panels on, 554
  structural facing tile, 183–184
Masonry cement, 192
Masonry fireplaces, 627–631
Masonry garden walls, 978
Masonry heaters (masonry stoves), 634
Masonry site steps, 979
Masonry ties, 195–197
Mass, thermal, 90
Massage rooms, 796
MasterFormat™, 147, 149–150
Matching, for wood veneers, 249–251
Material processing and handling equipment, 655–658
Materials:
  ballistic-resistant, 908
  ceiling, 616
INDEX

Materials, (continued)
  for fabric structures, 890
  for food service equipment, 798–799
  movement of, 109
  non-suspended ceilings, 611
  piping, 670–674
  playground, 971
  porous paving, 946–947, 995–996
  resilient flooring, 604
  sound absorption properties of, 95–97

Materials symbols, 146
Mat foundations, 296, 297
Mathematical data, 1019–1024
Mats, floor, 606–607
Maximum allowable height, 940
Maximum allowable length, 940–941
Maximum allowable width, 940
MC steel shapes, 217
MDF (medium-density fiberboard) cores, 248
Mechanical anchoring systems, 555
Mechanical components, 879, 895
Mechanical draft cooling towers, 710
Mechanical finishes, metal, 212
Mechanically attached sheets, 485
Media, communication, 767
Medical equipment, 807–810
Medical facilities, 689–690
Medium-density fiberboard (MDF) cores, 248
Medium-heat chimneys, 701
Medium-voltage electrical distribution, 1002
Medium-voltage switchgears, 1002
Meeting edge, double door, 571
Membranes:
  air barrier, 433–434
  horizontal waterproofing, 493–494
  poured flooring, 605–606
Membrane roofing:
  elastomeric, 494–495
  modified bituminous, 479–484
  protected, 492
  thermoplastic polyolefin, 485–490, 503–504
Men:
  anthropometric data for, 14–15
  toilet rooms for, 68
Mercantile equipment, 785–796
  barber shops, 794–795
  beauty shops, 794–795
  checkroom, 794
  pet grooming, 796
  retail, 785, 787–789
  spas, 796
  vending, 790–794
Mercury, in lamps, 758
Mercury-vapor (MV) lamps, 759
  Mesh supports, concrete, 169
  Metal(s), 210–231
  balconies, 344–345
  characteristics of, 210–211
  decorative, 224–228
  door jambs, 459
  exterior wall panels and cladding, 424–427
  finishes on, 212–213
  fixed ladders, 425–427
  installation guidelines and construction tolerances, 218–231
  properties of, 210–211
  superstructure components, 214–215
  structural framing, 340–355
  typical products, 216–223
  utility trench drain assemblies, 998
  wall plugs, 198
  Metal bead, 558
  Metal building systems, 894–897
  Metal ceilings, 616–617
  Metal cladding panels, 425–427
  Metal decking, 337–338, 404, 476
  Metal detectors, 805
  Metal facade panels, 427
  Metal framing. See also Cold-formed steel framing
  for ceilings, 615
  as conductor, 766, 767
  for exterior walls, 347–348
  for interior partitions, 529–533
  for openings, 347–349
  sidings on, 417
  space frames, 345–347
  stone panels on, 417–422, 553, 555
  stone veneer on, 421
  Metal furring channels, 615
  Metal guardrails, 344–345, 619
  Metal halide (MH) lamps, 759
  Metal lath, 562, 563, 614
  Metal louvers, 434–437
  Metal panel wall assemblies, 424–425
  Metal plate connectors, 377
  Metal roofing, 495–501, 513
  Metal roofing tiles, 477
  Metal stairs, 351–355
  Metal trim, 558
  Metal-web wood joists, 364
  Meters, water, 666
  Methyl methacrylate flooring, 606
  Metric units, for construction, 1019–1021
  MH (metal halide) lamps, 759
  Microelectronics clean rooms, 882
  Microline concrete, 292
  Microwave ovens, 820
  Middle school classrooms, 862
  Mineral composition cores, door, 580
  Mineral-fiber cement tiles, 476–477
  Mineral-fiber reinforced cementitious panels, 415
  Minimum operating pressures, 662
  Minipiles, 296
  Mirrors, 569
  Mitered hip roofs, 475
  Miter joints, 549
  Mitigation, of cascading effects, 133, 135
  Mixed climates, 316
  Mobile buildings, 878, 879
  Modern fireplaces, 629–630, 633–634
  Modified bituminous membrane roofing, 479–484
  Modular concrete panel vaults, 888
  Modular panel rooms, 904
  Modular plug-in electrical distribution, 751
  Moisture. See also Heat, air, and moisture (HAM)
  controlling, 935
  and density of soils, 935
  in wood, 234–236
  Moisture-resistive cores, 248
  Molded ties, 611
  Moldings:
    classical, 1009–1010, 1012
    transition, 607
    wood, 547–550
  Moment loads, 285
  Moment-resisting frames, 340
  Mortar, 191–194
  ASTM specifications for, 191
  ceramic tile, 567
  for glass unit masonry, 185
  joints and, 193, 194
  materials, 192–193
  recommended types, 192
  stone flooring, 600
  Mortar beds, 555
  Mortise-and-tenon joints, 366
  Mosaic tiles, ceramic, 596
  Motor control centers, 746
  Motor starters, 744–745
  Mounted tiles, 596
  Mounting brackets, ladder, 354
  Mounting flanges, window, 444
  Movable floors, 600
  Movable furnishings, 849–876
  children’s furniture, 861
  convertible furniture, 860–861
file systems, 873–874
hospitality furniture, 858–860
interior landscaping, 875–876
library furniture, 867–868
office furniture, 849–856
school furniture, 861–867
seating, 856–858, 874–875
shelving, 872–873
systems furniture, 868–872
Moveable cleats, 496
Movement, building, 316–319, 439
Movement joints, 198–199, 566, 597, 601
Moving ramps, 654–655
Moving walks, 653–655
M steel shapes, 217
Mullions, 269, 450, 452, 453, 455
Mullion louvers, 435
Multicolor coatings, 566
Multilane vehicle entry control point, 132
Multimedia conference rooms, 816
Multiple-aisle seating, 103, 823
Multiple-grid skylight, 521
Multipurpose dry chemical extinguishers, 734
Multiresidential streetscapes, 20
Multizone air distribution, 714
Multizone air handling units, 721
Muntins, 581
Murphy beds, 860–861
Museums, restrooms in, 71
Musical instruments, 826–827
MV (mercury-vapor) lamps, 759
Nailable baseplates, 348
Nails and nailing:
of glued floor systems, 246
of roofing, 473
of subflooring, 246
of underlayment, 245–246
for wood, plastics, and composites, 253–254
Nailers, 382, 430
Nail-in-channel assembly, 596
National Collegiate Athletic Association (NCAA), 958, 961
National Football League, 957, 958
Natural access control, 136–138
Natural barriers, 129–130
Natural conditions, for long-span structures, 320
Natural convection units, 698
Natural disasters, 108
Natural draft cooling towers, 710
Natural gas systems, 662–663
Natural surveillance, 134–138
Natural wetland systems, 925–926
NC (noise criteria), 105
NCAA (National Collegiate Athletic Association), 958, 961
NCS (U.S. National CAD Standard), 142
Needle beams, 290
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punched carpet, 603
Neoprene expansion joint assemblies, 513
Needle punche
INDEX

Overhead coiling doors, 583
Overhead poles, electrical, 1083
Overhead signs, 626, 627
Overheated climates, 88, 89, 282–283
Overlap carriers, 836
Overlays, panel product, 248

P
Packaged engine generators, 765–766
Packaged fountain equipment, 966–968
Packaged split systems, 719–721
Package receivers, 806
Pad-mounted transformers, 744, 1003
Paint booths, 888–889
Painting, 564–566
Panels, 868
access, 589–590
architectural, 401, 402
acoustic, 610
ballistic-resistant, 907
for concrete forming, 164
for cross-flow paint booth, 889
interior door, 581
plywood, 240–243, 246
for roof sheathing, 247
for subflooring, 246
for roof sheathing, 247
interior door, 581

Panel absorption, 96
Panelboards, electrical, 752–753
Panel cores, 247–248
Paneling, wood, 546–547
Panelized wall cladding, 423–424
Panels:
acoustic, 609–610
in athletic rooms, 919
control, 52, 637, 638
curved glass block, 207, 542
drop, 165
exterior wall, 415, 419, 420, 426–427, 429, 431
foam core panel wall systems, 429, 430
on interior walls, 552–556
modular concrete panel vaults, 888
modular panel rooms, 904
rainscreen, 411–412, 423
structural, 384–386
Panel siding, 415
Panel strips, 530
Panel-supported systems, furniture for, 868–869
Pan forms, 166
Panic hardware, 589
Paper-faced metal gypsum board accessories, 557
Parallel bars, 831
Parallel curb ramp, 47
Parallel coiling doors, 583
Parallel poles, electrical, 1083
Parallel signs, 626, 627
Parallel trusses, 377
Parapets:
curtain wall, 456, 457
drainage near, 505, 506
expansion joints at, 512–514
roofing at, 481
stone panels at, 418
Parking, accessible, 48–49
Parking lots, 942–945
Partial loading, on floors, 330
Partial penetration welds, 229, 231
Performance-rated panels, 241, 247
Performance theaters, 103–105, 821–824
Perimeter offices, 850
Perimeter sensor systems, 777
Permafrost, 86, 87
Permafrost climates, 86–87, 279–280
Permanent dewatering, 930
Permanents room signs, 626
Permits, swimming pool, 908
Personalization, 22
Personnel name strips, 626
Pet grooming, 796
Phosphor bulb coatings, 758
Photovoltaic glass, 262, 568
Photovoltaic (PV) systems, 762–764
Physical attack, resistance to, 126
Pianos, 826
Picture moldings, 550
Piece material handling equipment, 657
Piers, exterior wall connections to, 398
Pier-and-panel garden walls, 977
Pier foundations, 976
Pilasters, 167, 202–203, 1012
Piles:
for deep foundations, 293–296
extended buildings on, 87, 280
and grade beams, 287
replacing foundations with, 291
sheet, 931
Pile caps, 295
Pipe roller support, 302
Piping, 670–674
Dampening around, 312
elevated water tank, 663
fittings for, 671
foundation drainage, 993
for fountains, 967, 968
insulation for, 673–674
joints in, 671–672
materials for, 670–671
metal, 221
for plumbing fixtures, 663
roof penetrations for, 502–504
sanitary waste, 664, 665
space requirements, 681
storm drain, 682–683
subdrainage, 302, 993, 994
valves, 672–673
vent, 664–666
water supply, 661

X-ray radiation shielding, 902
Perforated metal, 225–227
Performance-rated panels, 241, 247
Performance theaters, 103–105, 821–824
Perimeter offices, 850
Perimeter sensor systems, 777
Permafrost, 86, 87
Permafrost climates, 86–87, 279–280
Permanent dewatering, 930
Permanent room signs, 626
Permits, swimming pool, 908
Personalization, 22
Personnel name strips, 626
Pet grooming, 796
Phosphor bulb coatings, 758
Photovoltaic glass, 262, 568
Photovoltaic (PV) systems, 762–764
Physical attack, resistance to, 126
Pianos, 826
Picture moldings, 550
Piece material handling equipment, 657
Piers, exterior wall connections to, 398
Pier-and-panel garden walls, 977
Pier foundations, 976
Pilasters, 167, 202–203, 1012
Piles:
for deep foundations, 293–296
extended buildings on, 87, 280
and grade beams, 287
replacing foundations with, 291
sheet, 931
Pile caps, 295
Pipe roller support, 302
Piping, 670–674
Dampening around, 312
elevated water tank, 663
fittings for, 671
foundation drainage, 993
for fountains, 967, 968
insulation for, 673–674
joints in, 671–672
materials for, 670–671
metal, 221
for plumbing fixtures, 663
roof penetrations for, 502–504
sanitary waste, 664, 665
space requirements, 681
storm drain, 682–683
subdrainage, 302, 993, 994
valves, 672–673
vent, 664–666
water supply, 661

X-ray radiation shielding, 902
Perforated metal, 225–227
Performance-rated panels, 241, 247
Performance theaters, 103–105, 821–824
Perimeter offices, 850
Perimeter sensor systems, 777
Permafrost, 86, 87
Permafrost climates, 86–87, 279–280
Permanent dewatering, 930
Permanent room signs, 626
Permits, swimming pool, 908
Personalization, 22
Personnel name strips, 626
Pet grooming, 796
Phosphor bulb coatings, 758
Photovoltaic glass, 262, 568
Photovoltaic (PV) systems, 762–764
Physical attack, resistance to, 126
Pianos, 826
Picture moldings, 550
Piece material handling equipment, 657
Piers, exterior wall connections to, 398
Pier-and-panel garden walls, 977
Pier foundations, 976
Pilasters, 167, 202–203, 1012
Piles:
for deep foundations, 293–296
extended buildings on, 87, 280
and grade beams, 287
replacing foundations with, 291
sheet, 931
Pile caps, 295
Pipe roller support, 302
Piping, 670–674
Dampening around, 312
elevated water tank, 663
fittings for, 671
foundation drainage, 993
for fountains, 967, 968
insulation for, 673–674
joints in, 671–672
materials for, 670–671
metal, 221
for plumbing fixtures, 663
roof penetrations for, 502–504
sanitary waste, 664, 665
space requirements, 681
storm drain, 682–683
subdrainage, 302, 993, 994
valves, 672–673
vent, 664–666
water supply, 661
INDEX
Private areas, in schools, 861
Private patient rooms, 807
Procedural spaces, medical equipment for, 808–809
Process support systems, 689–690
Procurement documents, 160
Professional soccer fields, 960
Project descriptions, preliminary, 148
Projection screens, 774, 775, 810
Project manuals, 148–150
Projectors, 774
Proofers (retarders), 800, 801
Property lines, footings at, 286
Proscenium stages, 104
Protected membrane roofing, 492
Protection:
- branch circuit, 747
- for decorative glass, 262
- fall, 470
- for gutters, 505
- lighting, 766–767
- nuclear, 125
- protection systems, 900–902
- radiological, 125
- slope, 924–925
- wall and door, 620–621
Protection board, 494
Protective coatings, concrete, 179, 180, 300, 301
Protruding objects, 45–46
Public pools, 910–913
ADA pool lifts for, 912
diving board dimensions, 913
requirements and dimensions, 910–911
with sloped entries, 912–913
transfer areas, 913
Public restrooms:
- accessible, 67–72
- for hotel guests, 70–72
- in museums, 71
- in restaurants, 70
- in schools, 71
- signage for, 626
Public telephones, 626
Pull stations, fire alarm, 742
Pumps:
- fire, 728–739
- at fountains, 967
- heat, 708, 719–721, 731
- sump, 670
- for swimming pools, 909
- vertical turbine, 967
- in water systems, 662
Pumping systems, fire-protection, 738–741
Purlins, 370, 382, 496
PVC roofing, 485
PV (photovoltaic) systems, 762–764
Pyramid framed skylight assembly, 519
Pythagorean theorem, 1021
Q
Quality assurance, commissioning and, 696
Quality mark, treated lumber, 238
Quarter-sliced veneers, 249
Queenposts, 378
R
Rabbeted bevel, 417
Raceway decking assemblies, 871
Raceways, 871
Racks:
- basket, 638–639
- basketball, 828
- battery, 764
- fire-suppression equipment, 740–741
- Rack ovens, 801
- Racquetball courts, 919, 920
- Radial walls, masonry, 201
- Radiants, 1021
- Radiant cooling elements, 724
- Radiant heating elements, 723–724
- Radiation protection systems, 900–902
- Radii, masonry, 201, 207
- Radio frequency (RF) shielding, 902–905
- Radiographic rooms, 809
- Radiological protection, 125
- Radius minimums, glass block construction, 542, 543
- Radius pieces, stone, 423
- Radon, 279
- Rafters, 374–376
- and cast roof decks, 386
- for glued-laminated construction, 381
- heavy timber, 430
- and skylights, 518
- for slate roofs, 476
- Rafter tails, 374
- Raft foundations, 296–297
- Rails, stiles and, 546, 580–581
- Railings, 371, 618–619
- Rainscreen panels, 411–412, 423
- Rainscreen walls:
  - expansion joint covers in, 318–319
  - expansion joints of roofs and, 514
  - flashing at, 434, 510
  - masonry veneers on, 407
- Rainwater drainage, 682–685
- Rainwater harvesting systems, 683–685
- Raised access floor systems, 751
- Raised curbs, 946
- Raised floor construction, 590–592
- Raised moldings, 547–548
- Rake moldings, 550
Ramps:
- at access flooring, 592
- accessible, 49–51
- curb, 46–48, 51
- exterior, 953–954
- moving, 654–655
- wood decking for, 372
Random matching, 249
Ranges, kitchen, 800, 819
Reach ranges, 43–44
Reading rooms, 868
Rear projection equipment, 814
Receptacles, electrical, 748, 754
Recessed floor mat systems, 607
Reciprocating water chillers, 709
Reclaimed wood, 236
Recording instrumentation, for seismic activity, 899–900
Recovery time, 110, 111
Recreational equipment:
- athletic, 827–833
- instrumental, 826–827
Recreation areas:
- baseball and softball, 955–957
- bocce, 962
- field and court construction, 965–966
- field hockey, 963
- football, 957–960
- lacrosse, 963
- rugby, 963
- sitework for, 955–966
- soccer, 960–962
- track and field, 964
Recumbent bikes, 829
Recyclable materials, 128
Red cedar shakes and shingles, 471, 472
Reduced wood framing, 363
Redundancy, 110, 728
Reed, Henry Hope, 1008
Reference symbols, 146
Reflection, law of, 1022
Reflective glass, 567
Refraction, law of, 1022
Refrigerant dehumidifiers, 727
Refrigerant hot gas heat recovery, 731
INDEX 1053

Refrigeration, 707–711
Refrigerators, 65, 802, 817, 820
Registers, 722
Reglets, stone, 423
Regular dry chemical extinguishers, 743
Regulations. See also specific organizations defined, 39
on exterior stairs and ramps, 953
on site lighting, 1001
on sound transmission, 98
Regulatory signage, 624
Reinforcement:
for CMU walls, 306, 540–541
for concrete, 170–174, 299
for foundations, 292
for masonry, 194–197, 405
for plaster joints, 562
territorial, 136
Reinforcing bars, 169–171, 194, 195
Reinforcing tapes, 560, 561
Relief valve discharge, 98
Remodeling
siting and layout in, 130–131
passive measures, 131–132
siting and layout in, 130–131
Resistance. See also Fire-resistance design
abrasion, 553, 948
ballasts, 125–126, 907–908
blast, 122–124, 467, 906
to physical attack, 126
thermal, 263
Resourcefulness, 110
Response, post-event, 134
Restaurants, 70, 846–849, 874–875
Restoration, of services, 134
Rest platforms, ladder, 353
Restrictions, swimming pool, 908
Restrooms, See Public restrooms
Retail buildings, internal shelters in, 117
Retail equipment, 785, 787–789
kiosks, 788
self-service checkout equipment, 787, 788
shopping carts, 789–789
traditional checkout equipment, 785, 787
Retaining walls, 972–976
cast-in-place concrete, 973–974
freestanding garden walls, 976–981
precast concrete, 974–976
reinforced CMU, 974–975
Retarders (proofers), 800, 801
Retention, of wood preservatives, 237
Reticulated gratings, 222
Retractable awnings, 523
Retractable barriers, 763
Retrieving information, from OCCS, 148
Return curbs, 46
Return edge, for acoustical panel ceilings, 610
Reveal overlay construction, 839
Reveal edge, for acoustical panel ceilings, 610
Reveal overlay construction, 839
Roof washers, 684
Roof vents, 521–522, 666
Rooftop plantings, 991–992
Roof ridge, 477, 506, 509
Roofing nails, 253
Roof decks, 952
Roofing nails, 253
Roof ridge, 477, 506, 509
Roof ridge, 477, 506, 509
Roof vents, 521–522, 666
Roof washers, 684
Room acoustics, 96–101
acoustic partitions, 99–101
impact noise, 98–99
noise reduction, 98
sound, 97
sound-absorptive materials, 97
sound control windows, 101
sound isolation, 98
transmission, 97, 98
Room designation signs, 268
Room temperature, 75
Roots, protecting existing trees, 987
Root prune trenches, 986
Rotary UPS, 764
Rotary veneers, 249
Rough carpentry, nails for, 253
Round holes, perforated metals with, 226
cast roof decking, 386
composites for, 379–382
connections of exterior walls and, 393, 394, 398
construction assemblies for, 326–329
coverings for, 471–501
design considerations for, 468–471
detailing for, 500–516
framing for, 357, 374–382
metal for, 349–351
openings in, 516–522
sheathing for, 244–247
space frame connections at, 347
wood for, 374–378
Roof coverings, 471–501
built-up bituminous, 477–479
coated foam, 491
collector arrays and, 706–707, 763
elastomeric and thermoplastic membranes, 484–490
fluid-applied, 491–492
horizontal waterproofing, 493–495
for low slope roofs, 477–499
metal, 495–499
modified bituminous membrane, 479–484
shingles, 471–473
slate, 474–476
for steep slope roofs, 471–477
tile, 473–477
transition flashing and, 508
vegetated, 492–493
wood shingles and shakes, 471–472
Roof decks, 952
Roofing nails, 253
Roof ridge, 477, 506, 509
Roof ridge, 477, 506, 509
Roof vents, 521–522, 666
Roof washers, 684
Room acoustics, 96–101
acoustic partitions, 99–101
impact noise, 98–99
noise reduction, 98
sound, 97
sound-absorptive materials, 97
sound control windows, 101
sound isolation, 98
transmission, 97, 98
Room designation signs, 268
Room temperature, 75
Roots, protecting existing trees, 987
Root prune trenches, 986
Rotary UPS, 764
Rotary veneers, 249
Rough carpentry, nails for, 253
Round holes, perforated metals with, 226
Route accessibility, 44–46, 602
Row-to-row spacing (seating), 822
RT (reverberation time), 105
Rubber flooring, 604
Rubber roll-up doors, 467
Rubble, 189
Rubblestone stone wall patterns, 980
Rugby fields, 963
Rumford fireplaces, 632–634
Runs, of exterior stairs, 953
Runaround coils, 731
Rungs, ladder, 353
Runners, 529, 564, 613
Running match method, 249
Runoff, 985, 995, 996
Runoff control systems, 925–929
Rustication, 177, 190, 1016
RVs, 939
Sabine, Wallace Clement, 96
Saddle hip roofs, 475
Saddle ridges, 474
Safes, 804–805
Safety:
and building resilience, 115–121
fire, 120–121, 170, 617–638
and flooding hazards, 119–120
of gravitational and lateral loads, 115
life, 132–134
of playgrounds, 971
of rainwater harvesting systems, 685
and seismic forces, 118–119
shelters for, 116–117
and skylights, 517
in theaters, 823
and wind loads, 115–116
Safety cages, 353
Safety glass, 567
Sand, pavers in, 949
Sandblasting glass, 569
Sandboxes, 866
Sanded panels, plywood, 240, 241
Sand floors, ice rinks with, 921, 922
Sand interceptors, 669
Sandstone, 188
Sandwich wall construction, 399
Sanitary utility sewage structures, 999
Sanitary waste systems, 663–670
and domestic water heaters, 666–668
drainage and waste lines in, 665
fixture traps for, 665
interceptors and separators, 668–670
sump pump systems, 670
vent piping for, 665–666
Saunas, 885–887
Sauna heaters, 887
Scale, of construction works, 148
Scarf joints, 549
School(s):
acoustics in, 103
art rooms, 865
classroom design, 863–864
desks, 865
furniture for, 861–867
general classrooms, 861–863
open classroom furniture, 866
restrooms in, 71
tables, 865, 867
Scientific notation, 1021
SCMs (supplementary cementitious materials), 175–176
Scott, Geoffrey, 1009
Screeds, 562
Screens, 618, 755, 774, 810
Screws, 251, 256, 258, 412
Screw bulk material conveyors, 655
Screw spline storefront assemblies, 447
Sculptures, 501, 504–506
Seals, 433, 546, 576
Sealants, 262
Sealant joints, 420
Sealers, concrete, 180
Seamless quartz flooring, 606
Seams:
canopy and awning, 523
metal roofing, 499–500
Seating:
at conference tables, 856
fixed, 845–849
movable, 857–858
in performance theaters, 822
for pool lifts, 912
in restaurants, 874–875
in schools, 865
Seating arrangements, 846, 847, 857
Seating capacity, 822
Seat walls, 979
Secant walls, 931
Secondary enclosures, animal, 918
Secondary stresses, long-span structure, 320
Secondary unit substations, 744, 745
Sectional doors, 464–466
Sectional sofas, 858
SectionFormat™, 147, 150–151
Security, 122–126
ballistic protection, 125–126
blast resistance, 122–124
chemical and biological agents, 124–125
cybersecurity, 126
forced entry/physical attack resistance, 126
and operational infrastructure, 132–134
radiological and nuclear protection, 125
and skylights, 517
Security auditing, 126
Security equipment, 784–786, 804–806
Security file cabinets, 874
Security glass, 261, 567
Security glazing, 542, 543
Security layering, 137
Security planning and design, 127
Security systems, 776–777
Seismic base isolation, 297–298
Seismic control, 899–900
Seismic design, 610, 612
Seismic forces, 118–119, 363
Seismic instrumentation programs, 899–900
Seismic joint covers, 318
Self-drilling expansion anchors, 255
Self-drilling fasteners, 258
Self-edge nosing, 843
Self-service checkout equipment, 787–788
Self-supporting membrane structures, 690
Semi-instantaneous water heaters, 668
Seminar-style classroom arrangements, 864
Semi-private patient rooms, 807
Sensors, 95, 776–777
Separators, sanitary waste, 668–670
Serlio, Sebastiano, 1007
Serpentine garden walls, 976
Serpentine marble, 552
Services, 642–777
communications, 767–777
conveying, 642–659
electrical, 744–767
fire protection, 732–743
HVAC, 691–731
intersections between, 132, 133
plumbing, 659–690
Service aisles, restaurant, 874
Service chases, 841, 842
Service walkways, rooftop, 511
Set screws, 258
Setting materials, tile, 596
Settlement, 283–284, 291
Seven-point dimension plans, 909–910
Sewers, 665
Shade, from landscaping, 985
Shades, window, 836
Shading coefficient, 263
Shading devices, 437–438, 517
Shadowboxes, 456
Shadow construction, 76
Shaft walls, 523–527
Shakes, 431, 432, 471–472
Shake-on colors, 178
Shallow air conditioning blades, 437
Shallow foundations, 285–289
Shallow marsh systems, 927, 928
Shampoo stations, 795
Shaping, metal, 211–212
Shear block storefront assemblies, 448
Shear loads, 285
Shear-resistant control joints, 975
Sheathing:
  - composite, 244–245
  - plastic, 244–245
  - plywood, 246–247
  - rigid insulation, 245
  - for roofs, 244–247, 382, 472
  - for soffits, 246–247
  - for walls, 244–245, 431–432
She-bolt tie rods, 169
Shed roofs, 374
Sheet identification, 143
Sheet metal, 214–215, 227, 504
Sheet metal screws, 258
Sheet piles, timber shoring and, 931
Sheet vinyl flooring, 604
Sheet waterproofing, 493
Shelf angles, 408
Shell (building), 314–525
  - design considerations for, 314–319
  - and energy consumption, 320–321
  - floor assemblies, 322–325
  - horizontal enclosures, 468–525
  - roof assemblies, 326–329
  - superstructure of, 329–387
  - sustainability of, 320–321
  - vertical enclosures, 387–467
Shelters, in buildings, 116–117
Shelving, 867, 868, 872–873
Shields, for wood, plastics, and composites, 254–258
Shielding:
  - architectural, 902
  - lead X-ray, 900–902
  - nuclear radiation, 905–906
  - radio frequency, 902–905
  - shielding effectiveness, 902
Shingles, 431, 432, 471–473
Shiplap siding, 417
Shock absorber (valve), 673
Shop-fabricated cabinets, 838–841
Shop-fabricated structural wood, 364–365, 375–378
Shopping carts, 788–789
Shored excavation, 931–933
Shoring, 291
Shouldered mortise-and-tenon joints, 366
Shoulder make-up and tail-off, 263
Shouldered mortise-and-tenon joints, 366
Showers, 638–639, 679, 681
Shower compartments, 61–62
Shower drains, 666
Shrinkage:
  - concrete, 170
  - of wood, 234–236
Shutters, rolling, 437, 438
Side boards, ice rink, 921
Side chairs, 857
Side tables, 858
Sidewalks, planting near, 989
Sidewall-vented water heaters, 702
Simple beams, 369, 1025–1026
Single-acting interior doors, 578
Single-acting interior doors, 578
Single-face fireplaces, 629
Single-face fireplaces, 629
Single-floor framing, 629
Single-floor framing, 629
Single-family dwellings, 139
Single-pitch framed skylight assembly, 520
Single-user bathrooms, 63
Single-user toilet rooms, 60
Single-zone air-handling units, 718–719
Single-zone air-handling units, 718–719
Single-zone all-air systems, 713
Sinks:
  - commercial food service, 799, 802, 803
  - plumbing for, 676–678
  - residential kitchen, 64, 818
Sisal fibers, in carpet flooring, 603
Site-built formwork, 165, 166
Site-built showers, 679
Sitework, 924–1003
  - for athletic and recreational areas, 955–966
  - basement excavation, 931–936
  - civil utilities, 993–995
  - development of site, 966–981
  - earthwork, 924–925
  - electrical utilities, 1001–1003
  - exterior stairs and ramps, 953–954
  - grading, 936–937
  - improvements to site, 938–942
  - landscaping, 981–991
  - manholes, inlets, and catch basins, 999–1000
  - parking lots, 942–945
  - pedestrian paving, 950–952
  - porous paving systems, 946–949, 995–997
  - rooftop planting, 991–992
  - runoff control systems, 925–929
  - storm drainage grates, 987–998
  - water management, 930
Siting, 130–131, 631
  - 6 North Building (St. Louis, Missouri), 34–38
  - Skincare rooms, 796
  - Skip joists, 332
  - Skylights, 375, 376, 516–521
  - Slabs:
    - cantilevered, 345
    - concrete, 321–322, 326–328
    - concrete formwork for, 166–167
    - connections of exterior walls and, 395, 398
    - curtain walls at, 456
    - filigree, 337
    - heat transfer in, 724
    - openings in concrete, 173
    - post-tensioned, 101–102, 334
    - thresholds at, 462
    - topping, 724
    - walk-in cold storage room, 883
    - working, 494
  - Slab drainage, 951
  - Slab-on-grade construction, 87, 280, 301–302
  - Slats, door, 581, 583
  - Slate, 188, 474–476, 552
  - Sleep chairs, 861
Stained glass, 567
Stainless steel, 214, 845
Stairs:
- concrete, 339
- exterior, 953, 954
- finishes for, 609
- fire, 645
- masonry, 205–206
- metal, 351–355
- in platform framing, 357
- stone, 600
- wood, 372
Stair climbers, 830
Stair hangers, 535
Stair rails, 350, 351
Stair soffits, 537
Stalls, parking, 943–944
Stand-alone (off-grid) systems, 762, 763
Standard foundations, 284
Standards.
- See also specific organizations
- accessibility, 39, 40
- on computer room air-conditioning, 729
- defined, 39
- on electrical services, 744
- on fire protection, 732
- on floor loads, 330
- on HVAC systems, 691
- on toilet and bathing rooms, 67, 68
- on wood, 234, 235, 238–239, 572
Standing seam roofing, 495–497, 500
Standpipes, 736, 738
Standpipe-type roof washers, 684
Starkloff Disability Institute, 34
Starters, motor, 744–745
Starter strip, siding, 416, 417
Starting platforms, pool, 916
Static loads, 1025–1028
Staved lumber cores, door, 580
STC (Sound Transmission Class), 542
Steam baths, 887
Steel:
- AESS, 229, 341–342
- concrete, 215, 224
- columns for spread footings, 286
- concrete reinforcing with, 170–174
- filigree slabs on, 337
- lintels, 200
- portable buildings, 878–879
- sheets, coils, and plates, 214–215
- stainless, 214, 845
- supports for long-span curtain walls, 457
- taper ties, 168
typical products made of, 216–222
- wrought, 224
- Steel angles (structural framing), 220, 516
- Steel baseplates, 369
- Steel beams, 358, 535
- Steel compression bases, 381
- Steel doors, 574–576
- Steel framing. See also Cold-formed steel framing
- brick veneers on studs, 406
- for CMU walls, 404
- as conductor, 766, 767
- stone panels on, 417–421
- of superstructure, 340–344
- Steel joists, 247, 342–344, 614
- Steel (CS) piping, 670
- Steel stud and lead-coated gypsum board construction, 901
- Steep slope roofs:
  - characteristics and considerations with, 468
  - collector arrays on, 707, 763
- Steps, 372, 913, 979
- Step blades, 437
- Stepped footings, 164
- Stepped-pan-through-wall flashing, 506
- Steel curtain-wall construction, 452
- Storm drainage systems, 994–995, 999
- design considerations for, 994–995
- graters, 997–998
- piping, 682–683
- Storm-resistant blades, louver, 436
- Stormwater wetlands, 927–929
- Story drift, 118
- Stoves, accessible, 65
- Stove bolts, 256
- Straight flange expansion joints, 512
- Strap anchors, 555
- Strap footings, 285
- Streambanks, 925
- Street furniture, 133
- Street ramps, 953–954
- Strengthened glass, 260, 566
- Stressing tendons, 170, 172
- Stress (echo) treatment rooms, 808
- Stretched ceiling systems, 610–611
- Stretch-in installation, of carpet flooring, 603
- Stringerless systems, 591
- Stringers, 352, 384, 591–592
- Structural chemical grouting, 292
- Structural design and analysis tools (BIM), 157, 158
- Structural facing tile, 183–184
- Structural framing, 216–223
- angles, 220
- channels, 218–220
- for clay masonry exterior walls, 405
- gratings, 222–223
- shapes of, 216–218
- in superstructures, 340–344
- tees, 218–219
- tubing and pipes, 221–222
- zees, 220
- Structural glass, 261
- Structural integrity, 127
- Structural panels, composite, 384–386
- Structural performance, 439, 611
- Structural roof sheathing, 244
- Structural silicone glazing, 268, 269
- Structural silicone joint sealant, 454
- Structural steel, architecturally exposed, 229, 341–342
- Structural wall sheathing, 244
- Structural welds, 228–231
- Structure-borne sound isolation, 898–899
- Stucco, 413–414
- Student learning spaces, 863
- Stud-to-track connections, metal framing, 348
- Sturd-I-Floor, 241, 245, 247
- Subdivisions, 138
- Subdrainage, 302–303, 947–948
- Subfloors, 245–246, 595, 723
Subhearth air frames, 631
Submerged depth, 912–913
Submersible sump pumps, 670
Submittals, 160
Substations, 744, 745
Substitution requests, 160
Substrate, waterproofing, 493
Substructure, 274–312
basements, 304–312
cast-in-place concrete slabs, 298–303
crawl spaces, 303–304
foundations, 283–298
soils, 274–283
Subsurface drainage systems, 993–994
Sumped glass, 569
Sump pans, recessed, 350
Sump pump systems, 670
Superposition, 1014
Superstructure, 329–387
composite components, 373, 384–387
concrete components, 330–340
floor loads, 330, 331
roof framing, 374–382
structural metal components, 340–355
structural use comparison of systems, 329–330
wood components, 356–369, 371–373, 382–384
Supplementary cementitious materials (SCMs), 175–176
Supports:
collector array, 706
conglomerate, 169
equipment, 514–516
for excavations, 933–936
glass block, 541
guard rail, 345
masonry fireplace, 631
pipe roller, 502
piping, 674
plumbing fixture, 680
point, 458
sign, 516
space frame, 893
Support spaces, audio-visual, 814–816
Surcharged foundations, 296
Surcharge soil loading, 309, 310
Surface cooking work area, kitchen, 817
Surface drainage systems, 994–995
Surface-mounted corner guards, 621
Surface-mounted counterflashing, 511
Surface-mounted door closers, 584, 588
Surface runoff values, 995
Surface textures, interior window, 569
Surfaceing:
built-up bituminous roofing, 478–479
concrete work, 174–180
Surge reduction devices, 967
Surgical suites, 809, 810
Surveillance, natural, 136–138
Suspended ceilings, 609–610, 613
Suspended floors, 724
Suspended forms, 168
Suspended precast panel anchorage, 400
Suspension systems, ceiling, 610, 611, 614–617
Sustainability, 110
in building resiliency, 128–130
and building shell, 320–321
and electrical services, 744
and fountains, 971
and HVAC systems, 691
and plumbing, 660
Sustainable products, specifications for, 151
Swimming pool(s), 908–917
competition, 913–917
public, 910–913
residential, 908–910
solar heating systems for, 705
Swing-away lecture seating, 865
Swinging doors, 55
Switches, disconnect, 752
Switchboards, 745
Switch boxes, 535
Switchgear rooms, 744
Symbols, in drawings, 144, 146
Synthetic stone veneer, 423
Synthetic stucco, 413
Systems furniture, 868–872
kitchens, 63–66
parking, 48–49
public restrooms, 67–72
ramps, 49–51
routes, 44–46
toilet and bathing rooms, 57–63
wheelchair lifts, 53–54
Technological obsolescence, 114
Tee decks, 336
Tees, structural metal, 218–219
Telecommunications rooms, 768
Telecommunications systems, 766, 768–771
Telephones, 56–57
Teller and service equipment, 806
Temperature:
and air vents in saunas, 886
bitumen, 478
color, 94
hot water, 667, 668
Tempered glass, 260
Tenants, in resilience-based design, 130
Tensile structures, 890, 892
tensile structures, shell, 320
Tension cable trusses, 457
Tension lap splices, 173
Terminal control units, 712
Terminal reheat air distribution, 713–714
Termite shields, 237
terrazzo floor finishes, 601, 602
territorial reinforcement, 136–138
Testing, adjusting and balancing (TAB), HVAC system, 693–694
Testing, of deep foundations, 296
Textile wall coverings, 564
Text symbols, 146
Test telephones (TTYs), 56–57
Textured concrete, 177–178
Textured glass, 568
Theater and stage equipment, 821–826
design of performance theaters, 821–824
portable, 825–826
stage curtains, 825
Thermal collectors, solar, 703–704
Thermal comfort, 90–92
Thermal continuity, 439
Thermal cooling load, 729, 755
Thermal expansion, 1022
Thermal forces, 78
Thermal glazing, 450
Thermal impact, 74
Thermal insulation, 312
Thermal mass, 90
Thermal movement, of building shell, 316–319

T

TAB (testing, adjusting and balancing), HVAC system, 693–694
Tables:
in conference rooms, 855–856
in lounges, 858
in restaurants, 874, 875
in schools, 865, 867
Table tennis, equipment for, 832–833
Talent signs, 56, 626, 627
Taper tbes, 168
Task lighting, 755
Task method, 757
T-bar grating, 606
Technical criteria, 42–77
building blocks, 42–44
communications features, 56–57
curbs, 46–48
doors, 54–56
elevators, 51–52

kitchens, 63–66
parking, 48–49
public restrooms, 67–72
ramps, 49–51
routes, 44–46
toilet and bathing rooms, 57–63
wheelchair lifts, 53–54
Technological obsolescence, 114
Tee decks, 336
Tees, structural metal, 218–219
Telecommunications rooms, 768
Telecommunications systems, 766, 768–771
Telephones, 56–57
Teller and service equipment, 806
Temperature:
and air vents in saunas, 886
bitumen, 478
color, 94
hot water, 667, 668
Tempered glass, 260
Tenants, in resilience-based design, 130
Tensile structures, 890, 892
tensile structures, shell, 320
Tension cable trusses, 457
Tension lap splices, 173
Terminal control units, 712
Terminal reheat air distribution, 713–714
Termite shields, 237
terrazzo floor finishes, 601, 602
Territorial reinforcement, 136–138
Testing, adjusting and balancing (TAB), HVAC system, 693–694
Testing, of deep foundations, 296
Textile wall coverings, 564
Text symbols, 146
Test telephones (TTYs), 56–57
Textured concrete, 177–178
Textured glass, 568
Theater and stage equipment, 821–826
design of performance theaters, 821–824
portable, 825–826
stage curtains, 825
Thermal collectors, solar, 703–704
Thermal comfort, 90–92
Thermal continuity, 439
Thermal cooling load, 729, 755
Thermal expansion, 1022
Thermal forces, 78
Thermal glazing, 450
Thermal impact, 74
Thermal insulation, 312
Thermal mass, 90
Thermal movement, of building shell, 316–319
Thermal performance:
of flooring, 592
of glass block, 186
of windows, 439
of window treatments, 836
Thermal resistance, 263
Thermal wheels, 730
Thermoplastic polyolefin (TPO) membrane roofing, 485–490, 503–504
Thin brick veneer, 183
Thinset beds, 555
Thoroughfares, 938
Threaded joints, 671
Threading screws, 258
Three-compartment sinks, 802
Three-tab shingles, 473
Thresholds, 461–463, 591, 595, 599–600
Throats, masonry fireplace, 631
Through-the-wall gas-heating units, 697
Ticket windows, 806
Tiebacks, excavation, 934
Tie-hole treatments, 179
Tiered portable stage equipment, 826
Tie rods, 169
Ties, formwork, 164–165, 168–170
Tie wires, 564, 614
Tiles:
acoustic ceiling, 611–612
carpet, 602, 604
cast, 611
floor, 382
molded, 611
mounted, 596
nodular, 611
paver, 596
quarry, 596
roof, 473–477
Spanish, 473
stone, 597–598
structural facing, 183–184
vinyl, 604
water-felted, 611
Tiling, 596–598
Tilt-up concrete, 165, 392–398
 Timber retaining walls, 973
 Timber shoring, 911
 Time:
recovery, 110, 111
reverberation, 105
solar, 78–79
Time zones, 78
Tin, 210
Tinted glass, 260, 261, 567
Title blocks, 143
TL (sound transmission loss), 97
Toddlers, 6, 69
Toe clearances, 42, 838
Toggle bolts, 257
Toilet(s), 57–59, 680.
See also Water closets
Toilet compartments, 621–622
Toilet rooms,
accessibility of, 59–60, 67–70
children’s, 68–69
healthcare in-patient room, 69
patient, 69–70
public, 67–70
single-user, 60
Tongue-and-groove ceilings, 382
Tongue-and-groove siding, 417
Top-hung operable panel partitions, 545
Top-mounted air terminals, 766
Topographic maps, 936
Topping slabs, heat transfer in, 724
Top plates, 348, 361
Top rails, 619
Total internal reflection, 1022
Touch-sanded panels, plywood, 240
TPO (thermoplastic polyolefin) membrane roofing, 485–490, 503–504
Track, for sectional doors, 466
Track and field events, 964
Track splices, metal framing, 348
Traction elevators, 643, 646–647, 649
Trades jurisdictions, 149
Traditional checkout equipment, 785, 787
Traditional fireplaces, 629, 630, 632–633
Traffic:
carpet, 603
ladder, 353
stair, 350, 953
Tension, 749
Tension cable, 457
Tensioned panels, plywood, 240
Tertiary air distribution systems, 759
Square, 749
Transom, 596
Transoms, 450
Transportation fare collection equipment, 56
Traps, 664, 665
Trap arms, 665
Trapezoidal footings, 285
Trash chutes, 659
Trash production, daily, 659
Travel distances, elevator, 642
Travertine, 552
Treadmills, 830
Treads:
    ladder, 353
    stair, 350, 953
Treated wood, 236–239, 307–308, 373
Treatment rooms, equipment for, 808, 809
Tree(s), 986–986
    construction around existing, 986–988
    for flooring, 594
    in plywood, 240–241
    uplighting, 1002
    in urban areas, 988–991
    and veneer characteristics, 250, 251
Tree guards, 990
Trenches, 932–933, 986
Trench box, 933
Trench drains, 998, 999
Trench gratings, 223
Trench header ducts, 750
Trespass, light, 761
Tropics filters, 992
Trigonometry functions, 1021
Trim, 549–550, 552
Tri-Service plotting guidelines, 142
Trickling filters, 992
Trusses:
    and cast roof decks, 386
    exterior wood truss walls, 430
    metal, 349
    shop-fabricated, 365, 376–378
    tension cable, 457
Tsuru, Billie, 22
Tubing, metal, 221–222
tufted carpets, 601
Tuft, porous, 947
Turnbuckles, 257
Turning radius, 940
Turning space, wheelchair, 43
Turnstiles, security, 784–786
Tusk and soffit tenon joints, 366
TV armoires, 859
T-wall junctions, 166
25-meter and 25-yard competition pools, 915–916
Two-pipe, dual temperature system, 718
Two-pipe, ground-coupled water loop heat pump, 720–721
Two-sided structural glazing, 454
Two-stage sealant joints, 399
Two-way slabs, 332

UL (Underwriters Laboratory), 907
Ultraclear glass, 260
Unbonded single-strain tendon anchorage, 334
Undercarpet electrical power cables, 871
Underground duct banks, 1003
Underground utility lines, 987
Underground vaults, electrical, 1003
Underheated climates, 87–88, 281–282
Underlaymen:
heat transfer through, 723
nailing schedule for, 245–246
resilient, 898
wood flooring over, 594
Underpinnings, foundation, 285–289
Understand, in universal design, 20
Understructures, access flooring, 591
Underwriters Laboratory (UL), 907
Uneven bars, 830
Uniform background lighting, 757
Uniform Drawing System, modules, 142
Unintended consequences, 132, 135
Uninterruptable power supply (UPS), 635–636, 702
Unsanded panels, plywood, 240
Unsymmetrical groove weld symbols, 231
Urinals, 57, 58, 674–675, 680, 681
USGS (U.S. Geological Survey), 899
U-shaped kitchens, 66
U-strap column anchorage, 369
Utilities:
civil, 993–995
electrical, 1001–1003
fuel distribution, 661–663
laundry rooms connections for, 821
rooftop-mounted, 516
Utility lines, 987
Utility risers, hardened, 124
U-type concrete stairs, 339

V
Valves, piping, 672–673
Vans, 938
Van-accessible stalls, 945
Vanities, 19
Vapor barriers, for windows, 439
Vapor retarders:
in computer room air-conditioning, 728
for concrete slabs, 299
for exterior walls, 434
for low slope roofs, 469
Variable air volume (VAV) air distribution, 716
Variable-volume dual-duct systems, 715
Variable-volume single-duct systems, 716–717
Vaults:
equipment in, 804–806
of fountains, 968
installation of, 887–888
transformer, 744
types of, 888
underground electrical, 1003
Vaulting equipment, 830, 831
VAV (variable air volume) air distribution, 716
Vegetated roofing, 492–493
Vehicles:
blast effects on, 906
dimensions of, 938–939, 942
Vehicular equipment, 780–784
for deterrence, 781, 782
at loading docks, 780–781
site security barriers, 781–783
Velocity, runoff, 995
Vending equipment, 790–794
Veneers. See also Brick veneers; Wood veneers
adhered, 409–410
marble, 552–553
plaster, 558
stone, 189–190, 566, 617
thin brick, 183
Veneer cores, 248
Veneer grades, 240
Venetian blinds, 437
Vents:
B-, 634
fire and smoke, 522
masonry, 197
rooftop, 521–522, 666
sauna, 886
Vent hoods, 819, 820
Ventilation. See also Heating, ventilating, and air-conditioning (HVAC)
for crawl spaces, 383, 394
and thermal comfort, 90
Venting:
for condensing furnaces, 703
for gas appliances, 635–636, 702
for gas-fired heaters, 702
Vent pipe flashing, 501
Vent piping, sanitary waste system, 664–666
Vent stacks, 700–701
Vertical clearance, reduced, 46
Vertical enclosures, see Exterior vertical enclosures
Vertical file cabinets, 873
Vertical ladders, 353
Vertical storm drainage piping, 683
Vertical turbine pumps, 967
Vertical wheelchair lifts, 53
Vibration control, 898–899
Vibratory bulk material conveyors, 655
Video-conferencing, 810, 814, 815
Video systems, 774
Video teleconferencing, 775
Viewing angle, 103–104
Viewing area, 811–812
Viewing area, 811–812
Vinyl flooring, 604
Vinyl pool liners, 910
VINYL TILE FLOORING, 604
VINYL WALL COVERINGS, 564
VISIBLE LIGHT, 93
VISUAL ALARMS, 776
VISUALLY SYMMETRICAL TREES, 989
VISUAL PROGRAMMING INTERFACE, BIM, 158
VITRUVIUS, 1007–1009
VOICE-OVER-INTERNET PROTOCOL, 769
VOID FORMS, 176
VOLUME:
ARCHITECTURAL, 1023–1024
CALCULATING, 1023–1024
SOIL, 988–989
THERMAL EXPANSION OF, 1022
VOLUTES, CLASSICAL, 1012
W
WAFFLE SLABS, 332
WAINSCOT, 547, 621
WAIST-HEIGHT TURNSTILES, 785, 786
WAITING TIMES, LOBBY, 646
WAITSTAFF STATIONS, 802, 847
WALKS:
MOVING, 653–655
PEDESTRIAN, 948, 950–952
WALK-IN COLD STORAGE, 883
WALKING SURFACES, 45–46
WALK-OFF GRILLES, 606–607
WALKWAYS, 372, 511
WALLS.
SEE ALSO EXTERIOR WALLS; INTERIOR PARTITIONS; RAINSSCREEN WALLS; RETAINING WALLS
ACCESS PANELS IN, 589, 590
BALLISTIC-RESISTANT, 907
BARRIER, 783
BASEMENT, 304–308
BLAST WINDOW SUPPORT FOR, 124
BRAZED, 933
CAVITY, 445–446
CHEEK, 205
CONTROL JOINTS IN, 559
CURTAIN, 267, 447–450, 458
DRAINED CAVITY, 318, 392, 514
END, 998
ENERGY EFFICIENT, 88, 89, 281–283
EXPANSION CONTROL, 318
EXPANSION JOINTS AT ROOF INTERSECTIONS WITH, 512–514
FLASHING AT, 510
FOUNDATION, 287–289, 931, 932
FRAMING DOORS IN, 577
FRAMING INTERSECTIONS OF, 349, 361, 362
GRID, 384
HEAD, 808, 998
KNEE, 308
OF METAL BUILDING SYSTEMS, 896–897
OPENINGS IN CONCRETE, 173
POOL, 910
POST-AND-BEAM, 384
PROTECTION FOR, 620–621
RADIAL, 201
RETAINING, 972–981
SAUNA, 886
SEAT, 979
SECCANT, 931
SHEATHING FOR, 244–245
AND SKYLIGHTS, 520
SLURRY DIAPHRAGM FOUNDATION, 931, 932
OF SOUND-CONDITIONED ROOMS, 884
OF STEAM BATHS, 887
STONE, 979–981
AT STOREFRONTS, 448
TRANSFER, 913
UNDERPINNING, 290–291
VAULT, 888
FOR WINDOWS, 439
WALL ANCHORS, 255
WALL BASE, 604–605
WALL BRACKETS, GUARDRAIL, 619
WALL CLADDING, 423–427
WALL CONNECTIONS, SYSTEMS FURNITURE, 871
WALL COVERINGS, 564–566
WALL FORMS, 164–167
WALL GUARDS, 620–621
WALL-HUNG CABINETS, 838
WALL-HUNG LAVATORIES, 676–677
WALL-HUNG SINKS, 676–677
WALL HYDRANTS, 679
WALL MOUNTED FIRE DEPARTMENT CONNECTION, 737
WALL PANELS, ATHLETIC ROOM, 919
WALL PLATES, 375
WALL PLUGS, METAL, 198
WALL SECTIONS, STRUCTURAL FACING TILE FOR, 183–184
WALL SHEILD GROUNDING, 905
WARM AIR FURNACES, 711, 712
WARNINGS, DETECTABLE, 56, 627
WARNING SIGNAGE, 624
WARRANTIES, FOR ROOFING, 470, 471
WASHERS, 256, 797, 821
WASH SINKS, 678
WASTE WATER MANAGEMENT, 436, 437
WATER LEAKAGE OF, THROUGH WINDOWS, 439
IN MORTAR AND GROUT, 192
MOVEMENT ACROSS JOINTS OF, 392
TEMPERATURE OF HOT, 667, 668
WATER ABSORPTION, 551, 596
WATER-BASED DYES, 178
WATER-BASED FIRE-SUPPRESSION SYSTEMS, 732
WATERBORNE PRESERVATIVES, 237
WATER CHILLERS, 708–709, 730
WATER CLOSETS, 58–59, 674–675, 680–681
WATER CONSERVATION, 984
WATER COOLERS, 681–682
WATER DISTRIBUTION, 660–661
WATER DISTRIBUTION SYSTEMS, 712
WATER-HEATED (WATER-HEATED) TILES, 611
WATER HEATERS, 666–668, 702
WATER JET CUTTING, 570
WATER LOOP HEAT PUMPS, 720–721, 731
WATER MANAGEMENT, 436, 518, 930
WATER METERS, 666
WATER PLAY ENVIRONMENTS, 19
WATERPROOFING:
FOR BASEMENT WALLS, 310–311
FOR HORIZONTAL ROOFS, 493–495
AT ROOF TRANSITIONS, 511
WATER QUALITY, 683, 969
WATER REPELLENTS, 429
WATER SHED CONCEPT, FOR EXPANSION JOINTS, 496
WATERSTOP, FORMWORK WITH, 168
WATER TANKS, ELEVATED, 662, 663, 1000
WATERLIGHT DOORS, 466
WATER TREATMENT, 684–685, 688, 909
WATER VAPOR, 432–434, 469
WATTAGE, ELECTRICAL DEVICES, 747
WEATHER BARRIERS (WATER-RESISTANT BARRIERS):
IN EIFS SYSTEMS, 428
FOR ROOFS, 468, 469, 472
FOR STUCCO, 413
WEATHERING INDEXES, 182
WEATHERING PROBABILITY MAP, 284
WEATHERPROOFING, 443
WEATHERSTRIPPING, 462–463
WEB MEMBERS, ROOF FRAMING, 349
WEB STIFFENERS, 343
WEEPHOLES, 197
WEIGHT, OF MATERIALS, 1022–1023
WEIGHTLIFTING, EQUIPMENT FOR, 833
WELDED JOINTS, 225, 341, 401, 672
WELDED WIRE FABRIC REINFORCING, 170
WELLS, 303, 930
WELLNESS, IN UNIVERSAL DESIGN, 20
WELLPOINTS, 930
WESTERN (PLATFORM) FRAMING, 357–358
WET AREAS, FLOORING FOR, 607
WET-CHEMICAL FIRE-EXTINGUISHING SYSTEMS, 732–733
WET/DRY GLAZING SYSTEMS, 269
WET GLAZING, 268
WETLANDS, 925–929
WET SEALS, 426
WHEELCHAIRS, SEATING ARRANGEMENTS FOR PERSONS USING, 846
Wheelchair lifts, 53–54, 651
Wheelchair lift vans, 939
Wheelchair turning space, 43
Whirlpool bathtubs, 678
Williams, Tod, 22
Wind forces, 78, 363, 470, 984
Wind loads, 115–116
Windows:
  - acoustic, 898
  - ballistic-resistant, 908
  - blast, 123, 124
  - blast effects on, 906
  - cashier, 806
  - in classical architecture, 1015
  - EIFS rainscreen wall around, 412–413
  - exterior, 438–459
  - heat loss through, 264
  - interior, 566–570
  - interior trim, 549
  - metal framing for, 347
  - in precast concrete walls, 400
  - radiation shielding, 902
  - radio frequency shielding for, 904
  - sound control, 101
  - stone spandrels for, 419
  - in structural panels, 385
  - ticket, 806
  - wood framing for, 362
  - Window treatments, 836–837
Window units, manufactured, 264–269, 441
Winter garden atrium, 94
Wire and box anchors, 555
Wire chases, 385, 430
Wire connections, to systems
  - furniture, 871–872
  - Wired LANS, 772
  - Wire glass, 567
  - Wire lace anchors, 555
  - Wireless LANS, 772
  - Wire ties, 551, 534
  - Wiring, see Branch wiring
Women:
  - anthropometric data for, 16–18
  - toilet rooms for, 67
Wood:
  - characteristics of, 234–236
  - classification of, 236
  - for exterior walls, 429–432
  - heavy timber construction, 365–366, 382
  - installation guidelines, 252–258
  - as interior finish, 546–550
  - permeance of, 433
  - pole construction, 367–368
  - post and beam construction, 368–369
  - practices involving, 234–236
  - roofing materials, 471–472
  - shop-fabricated structural, 364–365
  - sleeper floor system, 308
  - sources of, 236
  - standards on, 234, 235
  - stone flooring over, 598
  - superstructure components, 356–369, 371–373, 382–384
  - treatments for, 236–239
  - typical products, 245–251
  - window detailing in, 444
  - Wood adhesives, 252
  - Wood blocking, 198
  - Wood ceilings, 612–613
  - Wood construction, 234
  - Wood decking, 371–373
  - Wood doors, 465, 573–574
  - Wood fiber panels, 415
  - Wood flooring, 593–596
  - Wood frame construction, 234
  - Wood framing:
    - for basement walls, 307–308
    - for floors, 356–361
    - interior doors in, 573
    - for interior partitions, 528–533
    - louvers with, 435
    - for openings, 361–363
    - plywood subflooring on, 245–246
    - reduced, 363
    - residential electrical wiring in, 748
    - for roofs, 374–378, 382
    - stone panels on, 554
    - veneers on, 408, 409
    - for windows, 362
Wood guardrails, 619
Wood screws, 255, 258
Wood trim, 540–550
Wood trusses, 430
Wood veneers, 248–251
  - on countertops, 943
  - cuts for, 249
  - grades for, 240
  - matching options for, 249–251
  - on panel products, 248–249
  - species characteristics, 250, 251
  - as wall coverings, 564
Woodwork, architectural, 548–549
Wool fibers, in carpet flooring, 603
Working slabs, horizontal waterproofing, 494
Workstations, 749–752, 869
Worktables, commercial kitchen, 799
Work triangle, kitchen, 818–819
Woven carpets, 602
Wraparound frames, 575
Wrestling, equipment for, 833
Wrought iron, 224
Wrought steel, 224
W steel shapes, 216, 218, 219
X
X-ray scanning equipment, 805–806
X-ray shielding, 900–902
Y
Youths, anthropometric data for, 7–13. See also Children
Z
Zamboni ice resurfacers, 832
Z-clips, 535
Zees, 220
Zinc, 210
Zone junction boxes, 749
Zoning, HVAC, 691–692