
INDEX

- Acceleration, 53
- Accuracy of computations, 5
- Aggregates, concrete, 365
- Air-entraining cement, 373
- AISC Manual, 230
- Algebraic analysis of truss, 33
- Allowable deflection, 275
- Allowable loads for:
 - nails, 222
 - plywood:
 - diaphragm, 514
 - roof deck, 198
 - shear wall, 518
 - steel:
 - bolts, 341
 - columns, 309
 - roof deck, 362
 - wood:
 - columns, 210, 316
 - joists, 191
 - nailed joints, 222
 - rafters, 194
- Allowable stress, 44
 - method, 59, 163, 166
 - steel columns, 309
 - structural lumber, 175
 - wood columns, 206
- Allowable stress design (ASD), 59, 163, 166
- American standard beams (S shapes or I-beams), 234
- American standard channels (C shapes), 616
- Amplitude of harmonic motion, 56
- Anchor bolts, 519
- Angles, structural steel, 235
 - double, 323, 621
 - gage for bolts, 343
 - properties of, 618, 621
 - as steel columns, 323
- Approximate analysis of structures, 437, 573, 586
 - design factors for concrete beams, 439
- Approximate design of tied concrete columns, 462
- Areas of:
 - slab reinforcement, 407
 - steel reinforcing bars, 376
- ASCE 2003, 151
- ASD (allowable stress design), 59, 163, 166

- Balanced reinforcement, strength design, 382
- Balanced section, 382
- Bars, reinforcing, *see* Reinforcement
- Basic wind speed, 160
- Beams:
 - analysis of, 61
 - bearing, 183
 - bending in, 47, 76
 - buckling, 147
 - cantilever, 66, 87
 - concentrated load, 67, 303
 - concrete, 444
 - connections:
 - steel, 334, 352
 - wood, 218
 - continuous, 66, 104, 437, 576
 - deflection, 47, 184, 291, 483
 - diagrams, typical loadings, 91
 - distributed load, 67
 - doubly-reinforced, 398
 - effective depth of concrete beam, 380
 - equivalent load, 133, 291
 - fixed-end, 11
 - flexure formula, 47, 98
 - framed connections, 218, 334, 352
 - girder, 66
 - girt, 66
 - header, 66
 - indeterminate, 105, 437
 - inflection, 85
 - with internal pins, 119
 - internal resisting moment, 95
 - investigation of, 61
 - joists, 66
 - lateral buckling, 147, 180
 - lateral support for, 147, 180, 263
 - loading, 67
 - load-span values, steel, 280
 - moment diagram, 78
 - moment in, 76
 - neutral axis, 95
 - overhanging, 66, 83
 - purlin, 66
 - rafter, 66
 - reactions, 66
 - resisting moment in, 95
 - restrained, 66, 114
 - rotational buckling, 149, 263
 - safe load tables for, steel, 280
 - sense (sign) of bending, 83
 - shear diagram, 74
 - shear in, 70, 99, 182, 266, 411, 444
 - simple, 66
 - stability, 147
 - statically indeterminate, 105, 437, 576
 - steel, 239
 - strength design of, 247, 377
 - stresses in, 99
 - T-beams, 390, 392
 - tabular data for, 91
 - theorem of three moments, 105
 - torsional buckling, 149, 263
 - types of, 66
 - under-reinforced, 383
 - uniformly distributed load, 67
 - web crippling, 268, 303
 - web shear, 266
 - web tearing, 338
 - width, concrete, 446
 - wood, 177
- Bearing in bolted connections, 336
- Bearing of wood beams, 174, 183
- Bending,
 - action in beams, 47
 - in concrete beams, 444
 - factors, columns, 328
 - resistance, 95
 - in steel beams, 257
 - stress, 95
 - in wood beams, 177
- Bending moment:
 - in beam, 76
 - diagrams, 78
 - negative, 83
 - positive, 83
- Block shear failure, 338
- Blocking for joists, 180
- Bolted connections:
 - bearing in, 336
 - block shear, 338
 - effective net area, 345
 - framed beam connections, steel, 352
 - gage for angles, 343
 - layout of, 342
 - in steel, 334, 352
 - tearing in, 338
 - tension stress in, 345
 - in truss, 354
 - in wood, 218
- Bolts:
 - capacity in steel, 341
 - edge distance in steel, 344
 - high-strength, 335, 340
 - sill, 519
 - spacing in steel, 344
 - unfinished, 340
- Bow's notation, 22
- Bracing of framed structures, 509
- Buckling:
 - of beams, 147, 249, 262
 - of columns, 127
 - lateral, 147
 - torsional, 149
 - of web of steel beam, 268, 303
- Building code requirements, 154
- Building construction, choice of, 499
- Built-up sections:
 - in steel, 306
 - in wood, 201

- Cantilever:
 - beam, 66, 87
 - frame, 139
 - shear wall, 512
- Cement, 367, 373
- Center of gravity, 597
- Centroid, 597
- Channels, steel, 616
- Chord in horizontal diaphragm, 513
- Classification of force systems, 14
- Cold-formed products, 236
- Columns:
 - bending factors for, 328
 - biaxial bending, 326
 - buckling, 127, 308
 - built-up steel, 306
 - combined axial load and moment, 129, 133, 213, 326, 457
 - design of:
 - concrete, 461, 581
 - steel, 306, 552
 - wood, 209
 - double angles, 323
 - eccentrically loaded, 213, 326, 462
 - effective buckling length, 128
 - end conditions, 128, 308
 - footing for, 484, 493
 - framing connections, 218, 334, 352
 - interaction, axial load plus moment, 130, 457
 - investigation, 126, 309
 - load tabulation, 552
 - P-delta effect, 129, 458
 - pedestals for, 454, 492
 - pipe, steel, 320, 421
 - reinforced concrete, 450
 - relative slenderness of, 127
 - round, concrete, 467
 - slenderness of, 127, 469
 - solid, wood, 204
 - spiral, concrete, 455
 - steel,
 - angle, 323
 - critical stress, 312
 - pipe, 320, 421
 - shapes of, 306
 - tubular, 321
 - W shapes, 306, 323, 552
 - structural tubing, 321
 - tied, concrete, 455
 - wide flange (W) shape, 306, 323
 - wood, 204
- Combined axial force and moment, 133, 326, 457
- Combined stress, compression plus bending, 133
- Compact shape, steel, 248
- Component of a force, 16, 18
- Composite construction, 360
- Compression:
 - in columns, 126
 - reinforcement in concrete beams, 398
- Compression elements:
 - buckling of, 127
 - columns, 126
 - combined compression and bending, 129, 133, 213, 326, 457
 - combined stress, 133
 - cracked section, 135
 - interaction, 130, 457
 - kern limit, 135
 - P-delta effect, 129, 458
 - pipe, 320
 - pressure wedge method, 135
 - relative slenderness of, 127
- Computations, 5
- Concentrated load, 67, 303
- Concrete:
 - balanced section properties, 382
 - beam, 377
 - beam with compressive reinforcement, 398
 - bents, 586
 - cast-in-place, 368
 - column, 450, 581
 - design methods, 461
 - P-delta effect, 458
 - round, 467
 - shape, 459
 - spiral, 455
 - tied, 455
 - type, 454
 - column footing, 484, 493
 - composite construction, 360
 - compression elements, 473
 - cover, 374
 - creep, 373, 434
 - deflection of beams and slabs, 447
 - development of reinforcement, 425, 470
 - effect of compression force, 450
 - flat-spanning systems, 436
 - foundations, 475
 - framing systems, 572
 - general requirements:
 - for beams, 444
 - for columns, 454
 - modulus of elasticity, 372
 - one-way continuous slab, 404, 438
 - pedestal, 454, 495
 - precast, 368
 - reinforcement for, 373, 451
 - rigid frame, 586
 - shape of beams, 445
 - shear in, 411
 - sitecast, 368, 389, 436
 - slab and beam system, 437, 573
 - slabs, 404, 436, 573
 - minimum thickness, 447
 - temperature reinforcement, 404
 - spacing of reinforcement, 386
 - specified compressive strength, 371
 - splice in reinforcement, 432
 - stiffness, 372

- Concrete: (*continued*)
 - stirrup, 411
 - strength of, 371
 - T-beam, 390, 392
 - temperature reinforcement, 404
 - vertical compression elements, 473
 - wall, footing, 476
 - width of beam, 446
- Concurrent force systems, 14
- Connection:
 - bolted:
 - steel, 334
 - wood, 218
 - field, 292
 - framing, 218, 334, 352
 - nailed, 220
 - shop, 292
 - steel, 238
 - tension, 345
 - truss, 292
- Containment, 452
- Continuous action of:
 - beams, 66, 576
 - frames, 586
 - slabs, 438
- Conversion factors for units, 5
- Core bracing, 546
- Cover, of reinforcement, 374
- Cracked section, 135
- Creep, 373, 434
- Crippling of beam web, 303

- Damping effect on harmonic motion, 58
- Dead load, of building construction, 152
- Deck:
 - concrete, 438
 - plywood, 196, 503, 533
 - roof, 503
 - steel, 338
 - with steel framing, 301, 549
 - wood plank, 195
- Deflection:
 - allowable, 275
 - of beams, general, 47
 - of concrete beams and slabs, 433
 - effects of, 272
 - equivalent uniform load for, 291
 - formulas, typical loadings, 91
 - of steel beams, 271, 551
 - of wood beams, 184
- Deformation, 2, 47
 - unit, 50
- Design methods, 166
- Development:
 - length for reinforcement, 425, 470, 485
 - of resisting moment, concrete beam, 377
- Diaphragm:
 - chord, 513
 - horizontal, 512
 - plywood, 512
- Dimension lumber, 172
- Direct stress, 41
- Distributed load, 67
- Double-angle shapes, 323, 621
- Double-angle struts, 323, 621
- Double shear, 336
- Doubly reinforced beams, 398
- Dowels, in footings, 485
- Drift, 161
- Ductility, 233
- Duration of load, wood, 176
- Dynamic behavior, 52
- Dynamic effects, 52
- Dynamics, 2, 52

- Earthquake, 162, also *see* Seismic effects
- Eccentric load:
 - on column, 213, 450
 - on footing, 133
 - as P-delta, 129, 458
- Edge distance of bolts in steel, 344
- Effective:
 - column length, 128
 - depth of concrete beam, 380
 - width of concrete T-beam flange, 392
- Elastic limit, 47
- Elastic stress-strain response, 49
- Energy, 55
- Equilibrant, 20
- Equilibrium, 15, 63
- Equivalent:
 - axial load, 133
 - static effect of dynamic load, 58, 162
 - uniform load, 291
- ETL (equivalent tabular load), 291
- EUL (equivalent uniform load), 291
- Euler buckling formula, 128

- Factored load, 167
- Factor of safety, 49
- Fasteners, for wood frames, 218
- Fiber products, wood, 200
- Field assembly, 292
- Fire resistance, 156
- Fixed end beam, 115
- Flexure:
 - in beams, 47
 - formula, 47, 96
- Floor deck:
 - concrete, 404, 438
 - plywood, 196, 503, 533
 - steel, 338
 - wood plank, 195
- Floor-ceiling space, in multilevel buildings, 448
- Footings, 475
 - column, 484
 - moment-resistive, 133
 - wall, 476

- Force:
 - actions, 13
 - classification of systems, 14
 - combinations, 16
 - components, 16, 18
 - composition, 16
 - equilibrant, 20
 - equilibrium, 15, 63
 - graphical analysis, 16
 - line of action, 13
 - notation for truss analysis, 22
 - parallelogram, 16
 - point of application, 14
 - polygon, 21, 23
 - properties, 11
 - resolution, 16
 - resultant, 16
 - space diagram, 22
 - systems, 14
- Foundations:
 - column footing, 484, 594
 - deep, 475
 - grade beam, 528
 - moment-resistive, 133
 - pedestal, 454, 492
 - shallow bearing, 475
 - wall, 476, 528, 594
 - wall footing, 476, 528, 594
- Framed, beam connections, 218, 352, 354
- Frames:
 - braced, 509
 - cantilever, 139
 - indeterminate, 139, 585
 - investigation of, 138
 - moment-resisting, 139
 - rigid, 139
 - trussed, 509
 - X-braced, 509
- Framing:
 - connections, 218, 334, 352
 - floor, 547, 556
 - plans:
 - concrete, 572
 - steel, 547, 556
 - wood, 505
 - roof, 505
- Frequency of harmonic motion, 56
- Gage in angles, 343
- Girder, 66
- Girt, 66
- Glue-laminated wood, 197
- Grade of:
 - reinforcing bars, 374
 - structural steel, 233
 - wood, 172
- Grade beam, 528
- Graphical analysis of truss, 25
- Gusset plate, 354
- Harmonic motion, 56
- Header, 66
- High strength:
 - bolts, 335, 340
 - steel, 233
- Hook in concrete, 425
 - equivalent development length of, 425
- Hooke's law, 47
- Horizontal:
 - diaphragm, 512
 - shear, 72, 99
- I-beam (American standard shapes), 234
- Indeterminate structures, 66, 105, 139, 437, 573
- Inelastic behavior, 98, 241
- Inflection in beams, 85
- Interaction, axial load and moment, 130, 457
- Internal forces,
 - in beams, 95
 - in rigid frames, 139
 - in trusses, 25
- Internal pins in:
 - continuous beams, 118
 - frames and beams, 119
- Internal resisting moment, 95
- Investigation of:
 - beams, 61
 - columns, 126
 - frames, 138
 - structures, 49
 - trusses, 25, 33
- Joints, method of, 25
- Joist girder, 299
- Joists:
 - girder, 299, 556
 - open web steel, 293, 521, 556
 - wood, 188, 533
- Kern, 135
- K factors for steel columns, 129
- Kinematics, 52
- Kinetics, 52, 54
- Lapped splice, 432
- Lateral:
 - bracing of:
 - beams, 147, 180, 189, 263
 - buildings, 509, 536, 545, 560, 585
 - buckling:
 - of beams, 147, 180, 262
 - of columns, 127, 204, 308
 - load, 159, 508
 - support for beams, 147, 180, 189, 263
 - unsupported length:
 - of beams, 262
 - of columns, 127, 204, 308
- Lateral resistive structures, 546
 - horizontal diaphragm, 508, 536
 - moment-resistive frame, 546, 586

- Lateral resistive structures, (*continued*)
 - perimeter:
 - bent, 547, 585
 - shear wall, 546
 - rigid frame, 546, 565, 585
 - shear wall, 511, 536, 546, 567
 - trussed bent, 546, 560
 - types of, 546
- Least weight selection, 241
- Light-gage steel elements, 236, 357
- Light wood frame, 502
- Line of action of a force, 12
- Lintels, 66
- Live load:
 - for floors, 155
 - reduction, 159, 575
 - for roofs, 157
- Load:
 - allowable, *see* Allowable load
 - beam, 66
 - building code, 151
 - combinations, 156, 163
 - concentrated, 67
 - dead (DL), 152
 - distributed, 67
 - duration, 156
 - wood, 176
 - earthquake, 155
 - eccentric, 129, 133, 213, 450, 458
 - equivalent:
 - static, 58, 162
 - uniform, 291
 - factored, 167
 - floor, live, 155
 - lateral, 159
 - live, 155, 157
 - periphery, 164, 552
 - roof, 157
 - seismic, 155
 - service, 59, 163, 166
 - superimposed, 257
 - uniformly distributed, 67
 - wind, 155, 159, 560, 586
- LRFD (load and resistance factor design), 60, 166
- Lumber:
 - allowable stresses for, 172
 - dimension, 172
 - properties of standard sizes, 622
 - sizes, standard, 622
 - structural, 172, 622
- Masonry wall, 520, 539, 567
- Mass, 55
- Materials, weight of, 153
- Maxwell diagram, 27
- Measurement, units of, 2
- Mechanics, 1
- Method of joints, 25
- Metric units, 4
- Minimum:
 - depth of concrete beam, 447
 - dimensions for concrete members, 447
 - reinforcement, 375, 388, 456
 - thickness of concrete slab, 434
 - width of concrete beams, 446
- Modification of design values, wood, 176
- Modulus:
 - of elasticity for direct stress, 49, 372
 - section, 98, 245, 609
- Moment:
 - arm, 62
 - beams, 64
 - diagram for beam, 78
 - of a force, 61
 - general definition, 61
 - of inertia, 98, 601
 - internal bending moment, 95
 - negative, 83
 - overturning, 161, 509, 538
 - positive, 83
 - restoring, 161, 509, 538
 - sense of, 83
 - stabilizing, 161
- Moment of inertia, 98, 601
 - transferring axis for, 604
- Moment-resisting frame, 139
- Moment-resistive foundation, 138
- Momentum, 55
- Motion:
 - dynamic, 54
 - harmonic, 56
 - of a point, 53
- Multistory rigid frame, 565
- Nailed joints, 220
- Nails, 220
- National Design Specification (NDS), 169
- Net section:
 - in shear, 336
 - in tension, 336
- Neutral axis, 95, 598
- Neutral surface, 95
- Newton, 4, 12
- Nomenclature, 6
- Nominal dimensions, 61
- Nominal moment capacity of steel beam, 247
- Nominal size, of lumber, 172, 612
- One-way slab, 404, 438
- Open web steel joists, 293, 521, 556
- Overhanging beams, 83
- Overturning moment on shear wall, 161, 509, 538
- Parallel axis theorem, 604
- Parallelogram of forces, 16
- P-delta effect, 129, 458
- Pedestal, concrete, 472, 454
- Penetration of nails, 220

- Perimeter bracing, *see* Peripheral
- Period of harmonic motion, 56
- Periphery, load, 164, 552
- Peripheral:
- bracing, 546
 - load, 164
 - rigid frame, 546
 - shear in concrete footing, 489
- Permanent set, 48
- Pin, internal:
- in continuous beams, 119
 - in frames and beams, 118
 - in rigid frames, 146
- Pipe columns, 320
- Pitch of bolts, in steel, 344
- Planks, wood, 195
- Plastic:
- hinge, 244
 - moment, 244
 - range in steel, 242
 - section modulus (Z), 245, 610
- Plywood, 196
- in built-up beams, 201
 - deck, 196, 503, 533
 - diaphragm, 512
 - horizontal diaphragm, 512
 - shear wall, 512, 517
- Point of inflection, 85
- Polygon of forces, 21, 23
- Ponding, 158
- Portland cement, 367
- Power, 55
- Precast concrete, 368
- Pressure:
- in soils, 477
 - wedge method, 135
 - wind, 155, 159, 509, 536, 560
- Principal axis, of section, 601
- Properties of:
- forces, 11
 - geometric shapes, 597
 - reinforcing bars, 376
 - structural materials, 44
- Properties of sections (areas):
- angles, steel:
 - double, 620
 - single, 618
 - balanced section, concrete, 383
 - built-up, 606
 - centroid, 597
 - channels, 616
 - double-angle shapes, 620
 - lumber, 622
 - moment of inertia, 601
 - parallel axis formula, 604
 - plastic section modulus, 245
 - principal axis, 601
 - radius of gyration, 610
 - section modulus, 609
 - single angle shapes, 618
 - statical moment, 598
 - steel pipe, 621
 - structural lumber, 622
 - transfer axis formula, 604
 - W shapes, 613
- Punching shear, 489
- Purlin, 66
- Radius of gyration, 610
- Rafters, 188, 504
- Reactions, 64
- Rectangular:
- beam in concrete, 378
 - stress block, strength method, 380
- Reduction of live load, 159, 575
- Reinforcement, 393
- anchorage of, 425
 - areas of, in slabs, 407
 - balanced, 383
 - for columns, 451
 - compressive, 398
 - cover for in concrete, 374
 - development of, 425, 470
 - grade of, 374
 - hook, 425
 - minimum, 375, 388, 456
 - properties of, 376
 - shrinkage, 405
 - spacing of, 386
 - splice, 432
 - standard bars, 376
 - temperature, 405
- Relative:
- slenderness of columns, 127
 - stiffness of columns, 127
- Repetitive member use, wood, 179
- Resistance factor, 167, 230
- Resisting moment in beams, 95
- Resonance of harmonic motion, 58
- Restoring moment, 161
- Restrained beam, 66, 114
- Resultant, of forces, 16
- Rigid frame, 138
- approximate analysis, 586
 - aspects of, 138
 - cantilever, 139
 - determinate, 138
 - indeterminate, 144, 586
 - for lateral force resistance, 565, 586
 - multi story, 565
 - single span, bent, 144
 - two-dimensional, 138, 565
- Rolled steel shapes, 234
- Roof:
- deck, 198, 503, 521
 - load, live, 157
 - plywood, 198, 503
 - steel, 521

- Rotational buckling, 149
- Round columns, concrete, 467
- Safe load for steel column, 309
- Safe load tables for:
 - column footings, 493
 - nails, 222
 - open web steel joists, 295
 - plywood:
 - diaphragm, 514
 - roof deck, 198
 - shear wall, 518
 - steel:
 - beams, 280
 - bolts, 341
 - columns, 316
 - roof deck, 362
 - wall footings, 480
 - wood:
 - columns, 210
 - joists, 191
 - nailed joints, 222
 - rafters, 194
- Safety, factor of, 49
- Sandwich panel, 281
- Scalar, 12
- Section modulus:
 - elastic, 98, 609
 - plastic, 245, 610
- Seismic effects, 162
- Sense of bending in beams, 83
- Separated joint diagram, 27
- Service load, 59, 163, 166
- Set, permanent, 48
- Shallow bearing foundations, 475
- Shapes, steel, 234
- Shear:
 - beam, 43, 70, 182, 266, 411
 - block, 338
 - in column footing, 488
 - in concrete beams, 411
 - diagram for beam, 74
 - direct, 43
 - double, 336
 - horizontal, 72
 - peripheral, 489
 - punching, 489
 - reinforcement, 411
 - single, 336
 - vertical, 70
 - wall footing, 481
- Shear in:
 - beams, 43, 70, 182, 266, 411
 - bolts, 335
 - concrete structures, 411, 481, 488
 - footings, 481, 488
 - steel beams, 266
- Shear reinforcement, 411
- Shear wall,
 - anchorage, 519
 - multi-story, 517
 - overturn, 509, 538
 - peripheral, 545
 - plywood, 512, 517
 - sill bolts, 519
 - sliding, 519
- Shop assembly, 292
- Shrinkage reinforcement, 405
- Sill bolts for sliding resistance, 519
- Simple beam, 66
- Simple support, 66
- Single angle shapes, 618
- Single shear, 336
- Sitecast concrete, 368, 389
- Size adjustment factor for:
 - dimension lumber, 175
 - wood beams, 179
- Slab and beam structure, 437, 573
- Slabs:
 - one-way, 404, 438, 573
 - reinforcement for, 405
 - thickness of, minimum, 434
- Slenderness:
 - of columns, 127, 205, 308, 469
 - ratio, 205, 308
- Sliding, due to wind, 519
- Soil pressure, 485
- Solid-sawn wood, 171
- Solid wood columns, 204
- Space diagram, 22
- Spacing:
 - of bars in concrete, 386
 - of bolts in steel, 344
 - of stirrups, 416
- Specified compressive strength of concrete, (f'_c), 371
- Spiral column, concrete, 455
- Splices in reinforcement, 432
- Stability:
 - of beams, 147
 - of columns, 127
- Stabilizing moment of building weight, 161, 517, 536
- Staggered bolts, 342
- Standard notation, 6
- Standard shapes, steel, 234
- Standards for structural design, 500
- Static equilibrium, 2, 15
- Static moment, 101, 598 Statically indeterminate:
 - beams, 66, 104, 437, 576
 - frames, 144, 586
- Statics, 1
- Steel:
 - angle, 618
 - beam, 239
 - buckling of web, 303
 - deflection, 271
 - lateral buckling, 262
 - lateral unsupported length, 262
 - LRFD design selection, 250

- nominal moment capacity, 247
 - safe load tables, 280
 - section modulus, 98, 245, 609
 - shear in, 266
 - stability, 262
 - torsional buckling, 262
 - web buckling, 268
 - behavior of beams, 241
 - bending, design for, 257
 - bolts, 334
 - buckling of:
 - beams, 249
 - columns, 306
 - built-up members, 306
 - cold-formed products, 236, 357
 - columns, 306
 - critical stress, 312
 - safe loads, 316
 - compact shape, 248
 - composite structure, 360
 - connections, 238
 - fabricated components, 236
 - factors in beam design, 239
 - floor beam, 533
 - floor deck, 358
 - floor framing system, 547
 - joist girder, 299
 - light-gage products, 236, 357
 - open web joist, 293, 521
 - pipe, 320
 - plastic behavior, 242
 - products, 234
 - properties, 231
 - reinforcement, 373
 - rigid frame, 565
 - rolled shapes, 234
 - roof deck, 358
 - truss, 292
 - trussed bent, 560
 - usage considerations, 229
 - yield in, 47, 232
- Stiffness, 49
- relative, 127
- Stirrups, 411
- spacing of, 416
- Strain:
- general definition, 50
 - hardening, 242
- Strength:
- of concrete, 371
 - design method, 163
 - of materials, 2
 - ultimate, 48
 - yield, 48
- Stress, 2, 41
- allowable, 44
 - in beams, 43
 - bearing, 174
 - bending, 96
 - combined, 133
 - compression, 41
 - design, 59
 - direct, 41
 - flexural, 96
 - general definition, 2, 41
 - horizontal shear, 99
 - inelastic, 98, 241
 - kinds of, 41, 43, 47
 - shear, 43, 99
 - in soils, 477
 - strain behavior, 49
 - tensile, 41
 - types of, 41
 - unit, 41
 - yield, 47, 232
- Stress-strain:
- diagram, 232
 - ductility, 47, 232
 - modulus of elasticity, 49
 - proportional limit, 47, 232
 - yield stress, 47, 232
- Structural:
- alternatives, 545
 - analysis, 2
 - computations, 5
 - design, 2
 - investigation, 1, 49
 - lumber, 172, 622
 - design values, 173
 - materials, 44
 - mechanics, 1
 - safety, 49
- Strut, 323
- Studs, wood, 210
- Superimposed load, 257
- Suspended ceiling, 506
- Symbols, 6
- T-beams, concrete, 390, 392
- Tearing, in bolted connections, 338
- Temperature reinforcement, 405
- Tension connection, 345
- Tension elements:
- net section in, 336
 - upset end, threaded rod, 45
- Theorem of Three Moments, 105
- Threaded fasteners, steel, 334
- Tied concrete column, 455
- Time-dependent behavior, 52
- Torsional buckling of beams, 149
- Transfer axis formula, 604
- Trussed bent, 560
- Trussed bracing for steel frame, 560
- Trusses:
- algebraic analysis, 33
 - bracing for frames, 560
 - connections, 292
 - forces in members, 25
 - graphical analysis, 25
 - internal forces in, 25

- Trusses: (*continued*)
 joints, method of, 25
 joist girder, 229, 556
 manufactured, 521
 Maxwell diagram for, 27
 method of joints, 25
 open-web joists, 521
 separated joint diagram, 27
 space diagram, 27
 steel, 292, 526
 wood, 203
- Tubular steel columns, 321
- Ultimate:
 strength, 48
 strength design, 98
 stress, 98
- Under-reinforced concrete beam, 383
- Unfinished bolts, 340
- Uniform Building Code (UBC), 192, 197, 199
- Uniformly distributed load, 67
- Unit deformation, 50
- Units, of measurement, 2
 conversion, 5
- Unit stress, 41
- Uplift, 161, 509
- Upset end, threaded rod, 45
- U. S. units, 3
- Vector, 12
- Velocity, 54
- Vertical shear, 70
- W shapes, steel, 235, 306
 properties, 613
- Wall:
 footing, 476
 safe load for, 480
 foundation, 476
 masonry, 567
 shear, 512
- Web, crippling, steel beam, 303
- Weight, 55
- Weight of building construction, 153
- Wide flange (W) shapes, 235, 306
 properties, 613
- Wind:
 basic wind speed, 164
 bracing, 509, 536, 560, 585
 building code requirements for, 159
 design for, 160, 509, 536, 560, 585
 design wind pressure, 160
 direct pressure on walls, 509, 536, 560
 load determination, 509, 536, 560, 586
 overturning moment, 538
 pressure variation with height above ground,
 560
 uplift, 161, 509
- Wood:
 allowable stresses for, 173
- beams, 177
- bearing of beams, 183
- bending, 177
- board decks, 195
- bolted joints, 218
- built-up members, 201
- columns, solid, 204
 with bending, 213
 buckling of, 204
 compression capacity, 206
 design of, 209
 L/d ratio, 204
 lateral support, 204
 slenderness, 127, 204
 solid-sawn, 204
 studs, 210
 common wire nail, 220
- deflection of beams, 184
- design values for structural lumber, 173
- diaphragm, 512
- dimension lumber, 172
- duration of load, 176
- fiber products, 200
- floor joist, 188, 533
- glue-laminated products, 197
- grade, 172
- horizontal diaphragm, 512
- lateral support for beams, 180, 249
- light frame, 502
- lumber, 172, 622
- modified design values, 174, 176
- nails, 220
- nominal size, 172, 612
- plank deck, 195
- plywood, 196
- rafters, 188, 504
- repetitive use, 179
- roof deck, 198, 503
- sandwich panel, 201
- shear in beams, 182
- shear walls, 512, 517
- size factors for beams, 179
- solid-sawn, 171, 204
- stressed-skin panel, 201
- structural lumber, 172, 622
- studs, 210, 214, 508
- trusses, 203
- Work, 55
 equilibrium, 56
- Working stress method, 59
- X-bracing, 546
- Yield:
 point, 47, 232
 strength, 47, 232
 stress, 47, 232
- Z, plastic section modulus, 245, 610