Index

Air entrainment, 38 Allowable stresses, 377, 444 for concrete, 385, 444 for steel, 388, 444 table of, 384 American Steel and Wire, 438 Anchorage bearing plates, 217, 445 Anchorage take-up, loss due to, 88 Arrangement of steel, 188 As-drawn wires, 39 Bars, high-tensile, 41; see also Steel reinforcing, see Non-prestressed reinforcements B.B.R.V. system, 73 Beam layouts, cantilever, 242 continuous, 288 fully continuous, 290 partially continuous, 291 post-tensioned, 235 pre-tensioned, 234 simple, 232 Beam section, actual examples of, 184 constants for, 439 shapes of, 181 Bearing at anchorage, 216, 445 Bending moments, primary and secondary, 296 Biaxial prestressing, 33, 325 Billner system, 73 Blocks, concrete, 37, 38 Bond, at intermediate points, 207 prestress transfer, 211 Bonded tendons, 19, 450 Bridge girders, 249 Cable profiles and location, 236, 245, 314

Cables, concordant and non-concordant, 305, 309, 420 Calcium chloride, 415 Cantilever layout, 242 Cast-in-place construction, 20 Cement, high-early-strength, 36 self-expanding, 65 Ceramics, 38 Chemical prestressing, 65 Circular prestressing, 360 Circumferential prestressing, 362 Clifford-Gilbert system, 60 Collar for lift slabs, 343 Column action due to prestress, 351 Composite construction, 20, 446 Composite sections, analysis of, 141 design of, 170 Compression members, 354 Concordancy of cables, 305, 420 Concrete, admixtures for, 36 air entrainment for, 38 creep strains in, 34, 84 cube strength of, 383 curing of, 36 elastic shortening of, 80 elastic strain in, 31, 80 modulus of elasticity of, 32 modulus of rupture of, 31 Poisson's ratio of, 33 shearing strength of, 31 shrinkage strains in, 34, 84 slump of, 30 special manufacturing techniques, 36 strain characteristics, 31 strength requirements, 29 tensile strength, 31 water-cement ratio, 30 Continuous beams, 284

## 454

Cracking load, 23 Galvanized strands, 431 for composite sections, 142 Galvanized wires, 39, 426 Cracking moment, 129 Glass fibers, 46 Cracking strength, continuous beams, Grouting, 48, 450 318 Guyon, Y., 214, 221 tension members, 349 Cracks in reinforced beams, 16 Criteria for prestressed concrete, 98, 443 Hover, E., 3, 4 Dams. 8 Decentering, 22 Impact strength, 412 Deflections in beams, 226 Initial prestress, 102 Dill, R. E., 2 Inspection, 448 Doehring, C. E. W., 1 Dome prestressing, 371 Jacking stress, 102 Dorland anchorages, 58, 185, 261 Jacks, 56, 59, 448 Jackson, P. H., 1 Economics of prestressed concrete, 27, 393, 404 Effective prestress, 102 Elastic design, for composite section, tem 170 Leonhardt, F., 94 for continuous beams, 292 jacks, 63 for flexure, 151, 154, 160, 163, 167 system, 73 for shear, 195 Lick Garage, 185 for tension members, 345 vs. ultimate design, 178 Elasticity, modulus of, see Modulus of elasticity Electrical prestressing, 65 table of, 384 Elongation of tendons, 105, 449 Enclosures for steel, 48, 451 End-anchored tendons, 19, 420 End-block, transverse tension at, 219 Magnel, G., 4 Falsework, 398 jack, 62 Fatigue strength, 410 Fire resistance, 407 Flat slabs, 329, 334 Flexure, analysis for, 111 of steel, 43, 431 design for, 148 Formwork, 398 Moments, 296 Freyssinet, anchorages, 69, 426 Eugene, 3, 4 Morandi system, 69 jacks, 60, 62 method of arch compensation, 9 system, 259, 425, 426 Frictional loss of prestress, 92, 96, 98, 444 275, 277, 420

Holzmann system, 69, 70 Hose, corrugated sheet metal, 48, 426 Huettenwerk Rheinhausen system, 73 Layouts, beam, see Beam layouts Lee-McCall system, see Stressteel sys-Lift slabs, see Slabs Light-weight concrete, 38 Linear transformation, 305, 321, 420 Load factors, 377, 398, 421 Loading, stages of, 21 Loss of prestress, 80, 444 Low temperatures, effect of, 409

sandwich plates, 68 system, 68, 425, 427 Modulus of elasticity, of concrete, 32 Modulus of rupture, 31 Monierbau system, 73

Non-end-anchored tendons, 19, 420 Non-prestressed reinforcements, 272,

## Index

Over-reinforced beams, 137, 269 Partial prestress, 20, 161, 268, 420 Patents, 52 Piles, 417, 418 Pipes, joints of, 361 prestressed-concrete, 360 Plastic sheathing, 48, 49 Post-tensioning, 19, 420 anchorages, 66, 69, 73. 75 iacks. 60 Precast construction, 20 Preflex method. 66 Preliminary design, 148, 176 Preload anchorages, 69 Preload Company, 5, 425 Prescon system, 69, 71, 425, 434 Prestressed concrete, definition, 9 Prestressed reinforcements, 420; see also Steel: Tendons Prestressed steel, 9 Prestressing, external and internal, 18 full and partial, 20, 420 linear and circular, 19, 420 Prestressing bed, 55 Prestressing systems, 52 addresses of some, 425 comparison of, 76 table of. 54 Pre-tensioning, 19, 420 end anchorages, 57, 58 iacks. 55 systems, 55 Principal stresses, 196, 445 Protection for prestressed reinforcement. 190.446 Reinforced concrete, cost comparison with, 402 prestressed vs., 25 Retensioning, 22 Rigid frames, 416 Roebling, anchorages, 75, 216, 431 jacks, 61 system, 425, 431 Roof beam, 260 Roof panels, 187, 188 Safety, factor of, 30 of prestressed concrete, 26

Secondary moments, 296 Shapes of concrete section, 181, 439 Shear, 192 conventional design, 195 ultimate strength, 200 Shorer system, 59 Sign conventions, 110 Slabs, continuous flat, 334 flat. 340. 342 lift, 8, 330, 335 one-way, 324 two-way, 329 Stages of loading, 21 Steam curing of concrete, S6, 448 Steel, arrangement of, 188 chemical composition, 40, 41 creep characteristics, 44, 87 manufacture, 38 modulus of elasticity, 43, 431 physical properties, 41 proportional limit, 42 sizes, 45 treatment, 39 yield point. 42 Steiner, C. R., 2 Stirrups, 201, 446 Strands, high-tensile, 41; see also Steel Strescon system, see Prescon system Stress-relieving process, 39 Stresses, in concrete, 119 in steel, 123 Stressteel system, 73, 74, 425, 435 Tampa Bay Bridge, 186 Tanks, prestressed-concrete, 7, 361, 362, 368 Ten-mile Creek Bridge, 187 Tendons, 10, 420; see also Steel distance between and protections for, 191 size, cover, and spacing of, 446 Tension at end block, 219 Tension members, 345 Testing, 447 Texas P.I. system, 72, 425, 437 Thin shells, 416 Tiles, cloy, 38 Timoshenko, 8 Transfer, length of, 211 prestress, 21, 420

## 456

## Index

Transverse prestress, 324 Trusses, 416

Udall composite section, 144 Ultimate load, 24 composite section, 142 Ultimate moment, 132 Ultimate strength, in bond, 210 in shear, 200 of beams, 176, 445 of continuous beams, 318 of non-prestressed reinforcements, 277 of tension members, 349 Unbonded beams, 140 Unbonded tendons, 19, 450 Under-reinforced beams, 134 Unit cost, 398 Vertical prestressing in tanks, 368 Vibration, internal and external, 36, 448

Walnut Lane Bridge, 6, 7, 184 Web reinforcements, 201, 446 Wires, see Steel as drawn, 39 galvanized, 39, 426, 431 lubricated, 214 rusted, 214 stress-relieved, 39 Working load, 23

Yield point of steel, 42 Young's modulus, see Modulus of elasticity