

Table of Contents

- About the Author p. v
- Preface p. xi
- 1 Introduction p. 3
 - 1.1 Structural Design p. 3
 - 1.2 Loads p. 6
 - 1.3 Building Codes p. 7
 - 1.4 Design Specifications p. 7
 - 1.5 Structural Steel p. 8
 - 1.6 Standard Cross-Sectional Shapes p. 12
 - Problems p. 17
- 2 Concepts in Structural Steel Design p. 21
 - 2.1 Design Philosophies p. 21
 - 2.2 American Institute of Steel Construction Specification p. 23
 - 2.3 Load Factors, Resistance Factors, and Load Combinations for LRFD p. 24
 - 2.4 Safety Factors and Load Combinations for ASD p. 26
 - 2.5 Probabilistic Basis of Load and Resistance Factors p. 30
 - 2.6 Steel Construction Manual p. 34
 - 2.7 Design Computations and Precision p. 36
 - Problems p. 38
- 3 Tension Members p. 41
 - 3.1 Introduction p. 41
 - 3.2 Tensile Strength p. 42
 - 3.3 Effective Area p. 50
 - 3.4 Staggered Fasteners p. 57
 - 3.5 Block Shear p. 64
 - 3.6 Design of Tension Members p. 67
 - 3.7 Threaded Rods and Cables p. 76
 - 3.8 Tension Members in Roof Trusses p. 79
 - 3.9 Pin-Connected Members p. 88
 - Problems p. 90
- 4 Compression Members p. 109
 - 4.1 Introduction p. 109
 - 4.2 Column Theory p. 110
 - 4.3 AISC Requirements p. 117
 - 4.4 Local Stability p. 121
 - 4.5 Tables for Compression Members p. 130
 - 4.6 Design p. 132
 - 4.7 More on Effective Length p. 138
 - 4.8 Torsional and Flexural-Torsional Buckling p. 155
 - 4.9 Built-Up Members p. 162
 - Problems p. 171
- 5 Beams p. 189
 - 5.1 Introduction p. 189
 - 5.2 Bending Stress and the Plastic Moment p. 190

- 5.3 Stability p. 196
- 5.4 Classification of Shapes p. 198
- 5.5 Bending Strength of Compact Shapes p. 199
- 5.6 Bending Strength of Noncompact Shapes p. 211
- 5.7 Summary of Moment Strength p. 215
- 5.8 Shear Strength p. 216
- 5.9 Deflection p. 224
- 5.10 Design p. 226
- 5.11 Floor and Roof Framing Systems p. 239
- 5.12 Holes in Beams p. 245
- 5.13 Open-Web Steel Joists p. 248
- 5.14 Beam Bearing Plates and Column Base Plates p. 251
- 5.15 Biaxial Bending p. 265
- 5.16 Bending Strength of Various Shapes p. 276
- Problems p. 281
- 6 Beam-Columns p. 299
- 6.1 Definition p. 299
- 6.2 Interaction Formulas p. 300
- 6.3 Methods of Analysis for Required Strength p. 305
- 6.4 The Moment Amplification Method p. 307
- 6.5 Braced versus Unbraced Frames p. 310
- 6.6 Members in Braced Frames p. 311
- 6.7 Members in Unbraced Frames p. 327
- 6.8 Design of Beam-Columns p. 339
- 6.9 Trusses with Top-Chord Loads Between Joints p. 358
- Problems p. 363
- 7 Simple Connections p. 377
- 7.1 Introduction p. 377
- 7.2 Bolted Shear Connections: Failure Modes p. 380
- 7.3 Bearing Strength, Spacing, and Edge-Distance Requirements p. 382
- 7.4 Shear Strength p. 388
- 7.5 Installation of High-Strength Bolts p. 394
- 7.6 Slip-Critical and Bearing-Type Connections p. 396
- 7.7 Design Examples p. 402
- 7.8 High-Strength Bolts in Tension p. 416
- 7.9 Combined Shear and Tension in Fasteners p. 428
- 7.10 Welded Connections p. 441
- 7.11 Fillet Welds 443 Problems p. 461
- 8 Eccentric Connections p. 477
- 8.1 Examples of Eccentric Connections p. 477
- 8.2 Eccentric Bolted Connections: Shear Only p. 478
- 8.3 Eccentric Bolted Connections: Shear Plus Tension p. 491
- 8.4 Eccentric Welded Connections: Shear Only p. 496
- 8.5 Eccentric Welded Connections: Shear Plus Tension p. 511
- 8.6 Moment-Resisting Connections p. 519
- 8.7 Column Stiffeners and Other Reinforcement p. 536

- 8.8 End Plate Connections p. 558
- 8.9 Concluding Remarks p. 572
- Problems p. 572
- 9 Composite Construction p. 593
- 9.1 Introduction p. 593
- 9.2 Shored versus Unshored Construction p. 604
- 9.3 Effective Flange Width p. 606
- 9.4 Steel Headed Stud Anchors p. 610
- 9.5 Design p. 613
- 9.6 Deflections p. 620
- 9.7 Composite Beams with Formed Steel Deck p. 624
- 9.8 Tables for Composite Beam Analysis and Design p. 636
- 9.9 Continuous Beams p. 644
- 9.10 Composite Columns p. 645
- Problems p. 655
- 10 Plate Girders p. 665
- 10.1 Introduction p. 665
- 10.2 General Considerations p. 667
- 10.3 AISC Requirements for Proportions of Plate Girders p. 670
- 10.4 Flexural Strength p. 672
- 10.5 Shear Strength p. 675
- 10.6 Bearing Stiffeners p. 680
- 10.7 Design Problems p. 713
- Appendix Plastic Analysis and Design p. 718
- A.1 Introduction p. 718
- A.2 AISC Requirements p. 720
- A.3 Analysis p. 721
- A.4 Design p. 726
- A.5 Concluding Remarks p. 729
- References p. 730
- Answers to Selected Problems p. 735
- Index p. 739