

## CONTENTS

PREFACE	19
1 PLASTIC BEHAVIOUR AND LIMIT ANALYSIS OF PLATES. . . . .	21
1-1 Plastic Deformation of Plates . . . . .	21
1-1.1 Introduction . . . . .	21
1-1.2 Various Kinds of Plastic Deformation of Plates . . . . .	22
1-1.3 Yield Lines . . . . .	23
1-2 Plastic Bearing Moments per Unit Length of Plates . . . . .	24
1-2.1 The Bearing Bending Moments . . . . .	24
1-2.2 Resultant Unit Bearing Bending Moment in the Plastic Hinge of an Orthotropic Reinforced Plate . . . . .	26
1-2.3 The Plastic Limiting Twisting Moment . . . . .	28
1-3 Fundamental Relations and Principles of Limit Analysis of Plates . . . . .	30
1-3.1 The Yield Criterion and Yield Surface . . . . .	30
1-3.2 Flow Rule . . . . .	31
1-3.3 The Statical Solution . . . . .	32
1-3.4 The Kinematic Solution . . . . .	33
1-3.5 The Complete Solution . . . . .	35
1-4 Equations of Equilibrium of Plates . . . . .	35
1-4.1 Equations of Equilibrium in Orthogonal Coordinates . . . . .	35
1-4.2 Equation of Equilibrium in Polar Coordinates for Axially Symmetric Plates . . . . .	37
1-5 Various Yield Criteria for Plates . . . . .	38
1-5.1 Criterion of the Maximum Bending Moments . . . . .	38
1-5.2 Yield Criteria of the Maximum Bending and Twisting Moments . . . . .	43
1-5.3 Quadratic Yield Criteria for Isotropic Plates. . . . .	46
1-5.4 Quadratic Yield Criteria for Orthotropic Plates . . . . .	53
1-6 Some Topics of Statical and Kinematic Solutions . . . . .	58
1-6.1 The Complete Solution of a Simply Supported, Circular Plate with a Concentrated Force in the Centre . . . . .	58

1-6.2	The Method of Virtual Work . . . . .	61
1-6.3	The Method of Limit Equilibrium . . . . .	63
1-6.4	Nodal Forces . . . . .	64
1-6.5	Deformations of the Plastic Plates . . . . .	65
CONTENTS		
2	RECTANGULAR PLATES WITH HINGED SUPPORTS . . . . .	67
2-1	Uniformly Loaded, Orthotropic, Rectangular Plates with Edges Supported by Hinges . . . . .	67
2-1.1	Elementary Kinematic Solution . . . . .	67
2-1.2	The Problem of the Optimum Reinforcement . . . . .	72
2-1.3	Hinge-Supported Rectangular Plates with Yield Fans . . . . .	75
2-1.4	Conditions for the Rise of the Roof-Shaped Plastic Mechanism . . . . .	83
2-2	Uniformly Loaded, Rectangular Plates with Hinged Supports along Three Edges . . . . .	85
2-2.1	Elementary Solution for Long Plates . . . . .	85
2-2.2	The Optimum Reinforcement of Long, Orthotropic, Rectangular Plates with Hinged Supports along Three Edges . . . . .	89
2-2.3	Uniformly Loaded, Short, Rectangular Plates with Hinged Supports along Three Edges . . . . .	90
2-2.4	The Optimum Reinforcement of the Short, Orthotropic, Rectangular Plates with Hinged Supports along Three Edges . . . . .	94
2-2.5	The Boundary between the Long and Short Rectangular Plates with Hinged Supports along Three Edges . . . . .	96
2-2.6	Uniformly Loaded, Long, Rectangular Plates with Hinged Supports along Three Edges and Yield Fans in Corner Regions . . . . .	97
2-2.7	Yield Fans of Uniformly Loaded, Short, Rectangular Plates with Hinged Supports along Three Edges . . . . .	100
2-2.8	The Boundary between the Long and Short Rectangular Plates with Hinged Supports along Three Edges and Exhibiting Yield Fans. . . . .	104
2-3	Uniformly Loaded Rectangular Plates Supported on Two Opposite Edges . . . . .	105
2-4	Rectangular Plates with a Triangular Load Distribution . . . . .	105
2-4.1	Rectangular Plates with Hinged Supports along the Periphery, Acted on by a Triangular Load Distribution in the Longitudinal Direction . . . . .	105

2-4.2	Rectangular Plates with a Triangular Load Distribution in the Transverse Direction . . . . .	108
2-5	Rectangular Plates with a Trapezoidal Load and Hinged Supports along the Periphery. . . . .	110
2-5.1	Trapezoidal Load Distribution in the Longitudinal Direction . . . . .	110
2-5.2	Trapezoidal Load Distribution in the Transverse Direction . . . . .	112
2-6	Uniformly Loaded Rectangular Plates with the Point Load in the Centre. . . . .	114
2-6.1	Various Forms of Yield-Line Patterns . . . . .	114
2-6.2	Uniform and Point Load Involving the Roof-Shaped Plastic Mechanism . . . . .	115
2-6.3	The Plate with Diagonal Yield Lines . . . . .	116
2-6.4	Plates with Corner Yield Fans . . . . .	117
2-6.5	Plates with Diagonal Yield Lines and Corner Yield Fans . . . . .	119
2-6.6	Rectangular Plates with Closed Elliptic Yield Fans . . . . .	120
2-6.7	Approximate Limit Analysis of Elongated Rectangular Plates with Sectoral Yield Fans . . . . .	122
2-6.8	Extreme Yield Curves Bounding the Sectoral Yield Fans of Elongated, Isotropic, Rectangular Plates. . . . .	125
2-6.8	Extreme Yield Curves Bounding the Sectoral Yield Fans of Elongated, Isotropic, Rectangular Plates. . . . .	131
2-7	Uniformly Loaded, Long, Rectangular Plates with a Point Load and Supported along the Opposite Short Edges . . . . .	131
2-7.1	The Point Load Applied in the Neighbourhood of the Centre. . . . .	131
2-7.2	The Point Load Applied in the Neighbourhood of the Supported Edge . . . . .	132
2-7.3	A Point Load Applied to the Free Edge of an Isotropic Plate. . . . .	135
2-7.4	A Point Load in the Neighbourhood of the Corner of a Supported and a Free Edge . . . . .	137
2-8	Uniformly Loaded, Wide, Rectangular Plates Supported along Two Opposite Edges and with a Point Load . . . . .	138
2-8.1	The Point Load Applied at the Midspan . . . . .	138
2-8.2	A Point Load Eccentrically Applied to a Uniformly Loaded, Wide, Rectangular Plate, Supported at Two Opposite Edges. . . . .	144
2-8.3	Criteria for Preventing the Development of Yield Fans . . . . .	149

2-9	Static Solutions for the Ultimate Loads on Rectangular Plates . . . . .	151
2-9.1	General Considerations . . . . .	151
2-9.2	Rectangular Plates with a Uniform Load . . . . .	152
2-9.3	Rectangular Plates with a Harmonic Load Distribution . . . . .	157
2-9.4	Rectangular Plates with Various Kinds of Curvilinear Loads. . . . .	163
2-9.5	Rectangular Plates with Complex Loading . . . . .	168
2-9.6	Two Kinds of Trapezoidal Loads on Rectangular Plates . . . . .	170
2-9.7	General Plane Load on Rectangular Plates . . . . .	173
2-9.8	The Statical Solution for the Ultimate Load Based on the Choice of a Statically Admissible Field of Twisting Moments . . . . .	175
2-9.9	Approximate Solution for a Point Load in the Centre . . . . .	177
2-9.10	The Complete Decomposition of the Moment Equation . . . . .	178
2-9.11	Translation of the Coordinate Origin into the Corner of the Plate . . . . .	182
2-9.12	The Lower-Bound Solution for the Ultimate Uniform Load on Rectangular Plates with Hinged Supports along Three Edges. . . . .	183
3	<b>YIELD-LINE PLANNING FOR RECTANGULAR PLATES WITH A CONCENTRATED LOAD. . . . .</b>	<b>186</b>
3-1	Ultimate Concentrated Load Applied in the Centre . . . . .	186
3-1.1	General Considerations . . . . .	186
3-1.2	Rectangular Plate with the Concentrated Load Applied in the Centre and With Diagonal Yielded Lines . . . . .	188
3-1.3	Rectangular Plate with Four Symmetric Yield Fans . . . . .	189
3-1.4	Rectangular Plate with a Closed, Circular Yield Fan . . . . .	198
3-1.5	Rectangular Plate with Two Compound Yield Fans . . . . .	199
3-1.6	Rectangular Plate with Two Sectoral Yield Fans. . . . .	200
3-1.7	Square Plates with a Point Load in the Centre. . . . .	203
3-2	Ultimate Point Load Eccentrically Applied to Rectangular Plates on Hinged Supports. . . . .	207
3-2.1	The Ultimate Point Load Corresponding to a Yield-Line Pattern of Straight Yield Lines . . . . .	207
3-2.2	Plastic Mechanism with Four Yield Fans . . . . .	208

3-2.3	Yield-Line Patterns Consisting of Fans and Straight Lines . . . . .	219
3-2.4	The Yield-Line Pattern Formed by a Closed, Circular Yield Fan . . . . .	221
3-2.5	Plastic Mechanism with Compound Yield Fans . . . . .	221
3-2.6	Plastic Mechanism with Two Sectoral Yield Fans . . . . .	228
3-2.7	The Sectoral Yield Fan Combined with Straight Yield Lines, Simple Fans and a Compound Yield Fan . . . . .	232
3-2.8	Ultimate Point Load Applied Close to an Edge . . . . .	236
3-2.9	A Point Load in the Neighbourhood of the Corner . . . . .	238
3-3	Concluding Remarks . . . . .	244
3-3.1	Yield-Line Planning for Orthotropic Plates . . . . .	244
3-3.2	The Essence and Aims of Yield-Line Planning. . . . .	245
3-3.3	The Constructional Features of Yield-Line Planning . . . . .	246
4	POLYGONAL, CIRCULAR AND ELLIPTICAL PLATES; PLATES OF SPECIAL FORMS . . . . .	249
4-1	Isotropic Polygonal Plates with Straight Yield Lines . . . . .	249
4-1.1	Irregular Polygonal Plates with Hinged Supports and Concentrated and Uniform Loads . . . . .	249
4-1.2	Regular Polygonal Plates with a Uniform Load, and a Point Load Applied in the Centre . . . . .	253
4-1.3	A Uniformly Loaded, Polygonal Plate with the Perimeter Circumscribed to a Circle . . . . .	255
4-2	Isotropic Polygonal Plates with Yield Fans. . . . .	257
4-2.1	Regular Polygonal Plates with the Concentrated Load in the Centre . . . . .	257
4-2.2	The Condition for Avoiding the Rise of Yield Fans . . . . .	260
4-2.3	Polygonal Plates with a Closed, Circular Yield Fan around the Point of Application of the Concentrated Load in the Centre . . . . .	260
4-2.4	Reduction of the Ultimate Concentrated Force Applied in the Centre of Polygonal Plates with Yield Fans by the Effect of the Uniform Dead Load. . . . .	262
4-3	Uniformly Loaded, Polygonal Plates with Yield Fans . . . . .	263
4-3.1	Plates without Concentrated Loads. . . . .	263
4-3.2	Uniformly Loaded, Polygonal Plate with a Small Concentrated Load in the Centre. . . . .	267
4-3.3	The Refined Solution for a Uniformly Loaded, Square Plate with Yield Fans . . . . .	269

4-3.4	The Extreme Yield Lines of Polygonal Plates with Yield Fans. . . . .	272
4-4	Singular Yield-Line Patterns of Polygonal Plates . . . . .	277
4-4.1	Uniformly Loaded, Polygonal Plate with a Point Load Applied Close to the Edge . . . . .	277
4-4.2	A Uniformly Loaded, Polygonal Plate with a Point Load on the Bisector of the Obtuse Angle Formed by Two Edges. . . . .	279
4-4.3	A Uniformly Loaded, Polygonal Plate with a Point Load Applied on the Bisector of the Acute Angle Formed by Two Edges . . . . .	281
4-5	Orthotropic Polygonal Plates. . . . .	283
4-5.1	Uniformly Loaded, Irregular Polygonal, Orthotropic Plates with a Point Load Applied in the Central Region . . . . .	283
4-5.2	A Uniformly Loaded, Regular Polygonal, Orthotropic Plate with a Point Load in the Centre . . . . .	286
4-6	Regular Polygonal, Orthotropic Plates with Yield Fans . . . . .	289
4-6.1	A Regular Polygonal, Orthotropic Plate with a Concentrated Load in the Centre . . . . .	289
4-6.2	The Reduction of the Ultimate Point Load Applied in the Centre of a Regular Polygonal, Orthotropic Plate by the Effect of the Uniform Dead Load . . . . .	292
4-6.3	Uniformly Loaded, Polygonal, Orthotropic Plates with Yield Fans . . . . .	292
4-6.4	A Uniformly Loaded, Polygonal, Orthotropic Plate with a Small Point Load in the Centre . . . . .	294
4-7	Plates with Curvilinear Boundaries . . . . .	295
4-7.1	Isotropic Plate with a Concentrated Load. . . . .	295
4-7.2	Isotropic Plates with Uniform and Concentrated Loads . . . . .	299
4-7.3	Orthotropic Plates with Curvilinear Boundaries . . . . .	300
4-7.4	The Statical Solution for Ultimate Loads on Isotropic Plates with Curvilinear Boundaries . . . . .	301
4-7.5	The Statical Solution for Orthotropic Plates with Curvilinear Boundaries . . . . .	304
4-8	Circular Plates with Hinged Supports . . . . .	304
4-8.1	A Uniformly Loaded, Circular Plate with a Point Load in the Centre . . . . .	304
4-8.2	Ultimate Point Load Eccentrically Applied on a Uniformly Loaded, Circular Plate with a Hinged Support on the Boundary . . . . .	307

4-9	Elliptical Plates with Hinged Supports. . . . .	308
4-9.1	A Uniformly Loaded, Isotropic, Elliptic Plate with a Point Load in the Centre . . . . .	308
4-9.2	Uniformly Loaded, Isotropic, Elliptic Plate with a Point Load Applied at the Focus. . . . .	310
4-9.3	Uniformly Loaded, Orthotropic Plates with a Point Load in the Centre . . . . .	311
4-10	Polygonal Plates with Rounded Corners. . . . .	312
4-10.1	Polygonal Plates with Hinged Supports and with a Point Load in the Centre . . . . .	312
4-10.2	Uniformly Loaded, Polygonal Plates with Rounded Corners . . . . .	314
4-10.3	Polygonal Plates with Rounded Corners Acted on by Uniform and Concentrated Loads . . . . .	317
4-10.4	The Ultimate Point Load Applied in the Centre of a Rectangular Plate with Rounded Corners and Hinged Supports. . . . .	318
4-10.5	The Ultimate Point Load Applied in the Centre of Uniformly Loaded, Rectangular Plates with Hinged Supports and Rounded Corners . . . . .	321
4-11	Uniformly Loaded, Polygonal Plates Supported at the Corners by Columns and with a Point Load in the Centre . . . . .	322
4-11.1	Isotropic, Regular Polygonal Plates. . . . .	322
4-11.2	Orthotropic, Regular Polygonal Plates . . . . .	324
4-11.3	Rectangular and Square Plates Supported at the Corners. . . . .	325
4-12	Uniformly Loaded Circular Plates Supported on the Peripheral Columns, with a Point Load in the Centre . . . . .	326
4-12.1	Isotropic Plates. . . . .	326
4-12.2	Orthotropic Plates . . . . .	329
4-13	Plates with Overhanging Boundaries . . . . .	329
4-13.1	Regular Polygonal Plates on Polygonal Supports . . . . .	329
4-13.2	The Circular Plates on Regular Polygonal Supports . . . . .	332
4-13.3	Regular Polygonal Plates on Circular Supports . . . . .	334
4-13.4	Rectangular Plates on Circular Supports . . . . .	338
4-14	The Statical Solution for the Bearing Capacity of Polygonal Plates . . . . .	341
5	<b>BUILT-IN PLATES.</b> . . . .	344
5-1	Uniformly Loaded, Rectangular, Built-in Plates . . . . .	344

5-1.1	Built-in Plates with Yield Fans. . . . .	344
5-1.2	Built-in Plates without Yield Fans, and the Application of Yield-Line Planning. . . . .	348
5-1.3	Built-in, Square Plates . . . . .	351
5-2	Uniformly Loaded, Orthotropic, Rectangular Plates Built-in along Three Edges . . . . .	357
5-2.1	Long Rectangular Plate with a Short Free Edge . . . . .	357
5-2.2	A Uniformly Loaded, Short, Built-in, Rectangular Plate with a Long Free Edge . . . . .	361
5-2.3	The Boundary Condition between Long and Short Rectangular Plates Built-in along Three Edges. . . . .	365
5-3	Uniformly Loaded, Orthotropic, Rectangular Plates with Built-in and Hinged Edges . . . . .	366
5-3.1	Rectangular Plates with Built-in Long Edges . . . . .	366
5-3.2	Rectangular Plates with Built-in Transverse Edges . . . . .	367
5-3.3	Criteria for Avoiding the Rise of Yield Fans in Plates Built-in along Two Opposite Edges. . . . .	369
5-3.4	The Uniformly Loaded, Rectangular Plate, Built-in along a Longitudinal Edge and Hinged Supports along the Other Edges . . . . .	370
5-3.5	The Uniformly Loaded Rectangular Plate with Three Hinged Supports and One Built-in Transverse Edge . . . . .	373
5-3.6	Criteria for Avoiding the Rise of Yield Fans in Plates with Three Hinged Supports and One Built-in Edge . . . . .	376
5-4	Built-in Plates with Uniform and Concentrated Loads. . . . .	376
5-4.1	Orthotropic, Rectangular, Built-in Plates with a Concentrated Load Applied at an Arbitrary Point . . . . .	376
5-4.2	Uniformly Loaded, Built-in Plate with Point Load Applied in the Centre . . . . .	378
5-4.3	Approximate Solution of a Uniformly Loaded, Built-in Plate with Concentrated Loads Applied at Various Points . . . . .	383
5-5	Rectangular Plates, Built-in along Three Edges, with Uniform and Concentrated Loads . . . . .	385
5-5.1	Concentrated Load Applied on the Longitudinal Axis. . . . .	385
5-5.2	The Concentrated Load Applied at an Arbitrary Point . . . . .	386
5-5.3	Uniformly Loaded Plates, Built-in along Three Edges, with a Point Load Applied in the Middle of the Free Edge . . . . .	388



5-6	Statical Solutions for the Bearing Capacity of Rectangular, Built-in Plates . . . . .	394
5-6.1	The Decomposition of the Moment Equation for Plates, Built-in around the Whole Periphery . . . . .	394
5-6.2	Two Statically Admissible Fields of the Unit Bending Moments of a Rectangular, Built-in Plate . . . . .	396
5-6.3	The Lower-Bound Solution for the Ultimate Uniform Load of Plates with Built-in Opposite Edges . . . . .	401
5-6.4	The Statical Solution for the Ultimate Uniform Load of Plates with One Built-in and Three Hinge-Supported Edges . . . . .	402
5-7	Built-in, Polygonal Plates . . . . .	404
5-7.1	Uniformly Loaded, Polygonal Plates . . . . .	404
5-7.2	Uniformly Loaded, Polygonal Plates with a Small Point Load in the Centre . . . . .	405
6	SKEW PLATES . . . . .	406
6-1	Elementary Solutions for Skew Plates on Hinged Supports. . . . .	406
6-1.1	Isotropic Skew Plates Supported along Four Edges . . . . .	406
6-1.2	Anisotropic Skew Plates. . . . .	407
6-1.3	Orthotropic Skew Plates. . . . .	409
6-1.4	Optimum Reinforcement of Anisotropic Skew Plates . . . . .	411
6-2	Hinge-Supported, Skew Plates with Yield Fans . . . . .	413
6-2.1	Isotropic and Anisotropic Skew Plates . . . . .	413
6-2.2	Criteria for Preventing the Rise of Yield Fans in Anisotropic Skew Plates. . . . .	420
6-2.3	Orthotropic, Skew Plates with Yield Fans. . . . .	421
6-3	Ultimate Uniform Load of Skew Plates with Hinged Supports along Three Edges. . . . .	424
6-3.1	The Long, Skew Plates without Yield Fans . . . . .	424
6-3.2	Uniformly Loaded, Short, Skew Plates with Hinged Supports along Three Edges . . . . .	428
6-3.3	The Boundary between Long and Short Plates. . . . .	432
6-3.4	The Optimum Reinforcement of the Anisotropic, Long, Skew Plates with Hinged Supports along Three Edges . . . . .	434
6-3.5	The Optimum Reinforcement of Anisotropic, Short, Skew Plates with Hinged Supports along Three Edges . . . . .	436
6-4	Skew Plates with Hinged Supports along Three Edges and with Yield Fans . . . . .	438

6-4.1	A Long, Skew Plate with the Short, Free Edge . . .	438
6-4.2	A Short, Skew Plate with a Long, Free Edge . . .	442
6-4.3	The Boundary between the Long and Short Plates with Yield Fans . . . . .	448
6-4.4	The Criteria for Preventing the Development of Yield Fans . . . . .	448
6-5	Skew Plates Supported on Two Opposite Edges . . . . .	449
6-5.1	Uniformly Loaded, Skew Plates . . . . .	449
6-5.2	Skew Plates with Various Symmetric Loads . . . . .	450
6-5.3	Singular Yield-Line Patterns of Short, Skew Plates Supported on Two Opposite Edges . . . . .	453
6-6	Uniformly Loaded, Skew Plates with Hinged Supports along the Periphery and a Point Load in the Centre . . . . .	461
6-6.1	Various Forms of Yield-Line Patterns . . . . .	461
6-6.2	Isotropic, Skew Plate with a Prevailing Uniform Lo- ad . . . . .	462
6-6.3	Isotropic, Skew Plates with a Prevailing Concentra- ted Load . . . . .	465
6-6.4	Isotropic, Elongated, Skew Plates with Sectoral Yield Fans . . . . .	467
6-6.5	Anisotropic, Skew Plates with a Prevailing Uniform Load . . . . .	468
6-6.6	Anisotropic, Skew Plates with Diagonal Yield Li- nes . . . . .	471
6-6.7	Elongated, Anisotropic Skew Plates . . . . .	472
6-6.8	Orthotropic, Skew Plates with a Roof-Shaped Plastic Mechanism . . . . .	473
6-6.9	Orthotropic, Skew Plate with a Pyramidal Plastic Mechanism . . . . .	474
6-7	Built-in Skew Plates . . . . .	474
6-7.1	Uniformly Loaded, Isotropic, Skew Plates Built-in along Four Edges . . . . .	474
6-7.2	Anisotropic, Skew Plates which are Built-in along Four Edges . . . . .	479
6-7.3	• Long, Isotropic, Skew Plates which are Built-in along Three Edges . . . . .	484
6-7.4	Long, Anisotropic, Skew Plates which are Built-in along Three Edges . . . . .	486
6-7.5	Short, Skew Plates with a Long Free Edge . . . . .	486
6-8	Experimental Investigation of the Skew Reinforced-Concrete Plates . . . . .	488

7	PLATES WITH FREE SUPPORTS . . . . .	496
7-1	Regular Polygonal Plates . . . . .	496
7-1.1	Polygonal Plates with a Point load in the Centre. . . . .	496
7-1.2	Uniformly Loaded, Polygonal Plates with a Point Load Applied in the Centre . . . . .	498
7-2	Uniformly Loaded, Rectangular Plates with Free Supports. . . . .	499
7-2.1	Rectangular Plates Supported along the Periphery . . . . .	499
7-2.2	Uniformly Loaded, Long, Rectangular Plate with Free Supports along Three Edges . . . . .	504
7-2.3	Uniformly Loaded, Short, Rectangular Plate with Free Supports along Three Edges . . . . .	506
8	THE BEARING CAPACITY OF PLATES WITH SHEAR EFFECTS . . . . .	510
8-1	Shear Effects Determined by the Kinematic Method . . . . .	510
8-1.1	Fundamental Relations . . . . .	510
8-1.2	Uniformly Loaded, Built-in, Circular Plate . . . . .	511
8-1.3	Uniformly Loaded, Annular Plate, Built-in on the Outer Periphery . . . . .	512
8-1.4	Uniformly Loaded, Annular Plate, Built-in on the Inner Perimeter. . . . .	513
8-1.5	Reactions of Plates . . . . .	514
8-1.6	Interaction of Bending and Shear in a Uniformly Loaded, Orthotropic, Built-in, Rectangular Plate. . . . .	516
8-2	Shear Effects in the Statical Method . . . . .	519
8-2.1	Yield Criterion for Rectangular Plates with Shear Effects. . . . .	519
8-2.2	Axially Symmetric Plates with Shear Effects. . . . .	519
9	CONTINUOUS RECTANGULAR PLATES. . . . .	521
9-1	Uniformly Loaded, Continuous, Rectangular Plates with Peripheral Hinged Supports . . . . .	521
9-1.1	Straight Yield Lines of Continuous, Rectangular Plates on Continuous Supports . . . . .	521
9-1.2	The Bearing Capacity of an Inner Field of a Continuous Rectangular Plate. . . . .	521
9-1.3	The Solution for the Bearing Capacity of an Inner Field of a Continuous Rectangular Plate by the Method of Virtual Work . . . . .	528

9-1.4	Uniformly Loaded Boundary Fields of Continuous Plates with Hinged Supports . . . . .	530
9-1.5	Limit Design of Continuous Rectangular Plates . . .	534
9-1.6	The Optimum Reinforcement of Continuous Rectangular Plates . . . . .	538
9-2	Inner Fields of Orthotropic, Continuous Rectangular Plates with Yield Fans . . . . .	541
9-2.1	General Relations . . . . .	541
9-2.2	Criteria for Preventing the Development of Yield Fans . . . . .	545
9-2.3	Approximate Solutions for the Bearing Capacity of an Inner Field with Yield Fans . . . . .	546
9-3	Continuous Rectangular Plates with Free Edges . . . . .	552
9-3.1	Various Kinds of Boundary Fields of Continuous Plates with Free Edges . . . . .	552
9-3.2	The Boundary Field with a Short Free Edge . . .	552
9-3.3	The Boundary Field with a Long Free Edge. . . .	556
9-3.4	The Boundary between the Fields with the Short and Long Free Edges . . . . .	560
9-3.5	The Corner Field with Free Edges Perpendicular to Each Other . . . . .	560
9-4	The Boundary Fields with Yield Fans . . . . .	563
9-4.1	The Long Boundary Field with a Short Free Edge	563
9-4.2	The Short Boundary Field with a Long Free Edge	567
9-4.3	The Boundary between the Fields with the Short and Long Free Edges . . . . .	572
9-4.4	Criteria for Avoiding the Rise of Yield Fans . . .	573
9-5	Continuous Rectangular Plates with Uniform and Concentrated Loads . . . . .	573
9-5.1	The Uniformly Loaded, Inner Field with a Point Load in the Centre Involving an Asymmetric, Roof-Shaped, Plastic Mechanism . . . . .	573
9-5.2	The Uniformly Loaded, Inner Field with a Point Load in the Centre and a Symmetric, Roof-Shaped Plastic Mechanism . . . . .	575
9-5.3	The Uniformly Loaded, Inner Field with a Point Load in the Centre, Showing Diagonal Yield Lines	577
9-5.4	The Uniformly Loaded, Inner Field with a Point Load in the Centre and an Elliptical Yield Region	577
9-5.5	The Inner Field with a Concentrated Load Applied at an Arbitrary Point . . . . .	579