

*Engineering
Behaviour of
Rocks
Second Edition*

IAN FARMER

LONDON NEW YORK
CHAPMAN AND HALL



Contents

Preface	vii
---------	-----

CHAPTER 1	ENGINEERING DESCRIPTION OF ROCKS	
1.1	Rock testing	3
1.2	Uniaxial or unconfined strength	7
1.3	Empirical field and laboratory tests	14
1.4	Porosity and permeability	18
1.5	Discontinuous rock	24

CHAPTER 2	STRESS AND STRAIN	
2.1	Stress at a point	33
2.2	Pore pressure and effective stress	37
2.3	Strain at a point	42
2.4	Representation of stress and strain	44
2.5	Relation between stress and strain	45
2.6	Geostatic stresses	51
2.7	Measurement of <i>in situ</i> stress	54

CHAPTER 3	ROCK DEFORMATION	
3.1	Rock tests in compression	59
3.2	Rock deformation in compression	65
3.3	Mechanics of microfracture	69
3.4	Rock macrofracture	74
3.5	The complete rock deformation curve	77

CHAPTER 4	ROCK STRENGTH AND YIELD	
4.1	Rock strength criteria	81
4.2	Yield criteria	85
4.3	The critical state concept	89
4.4	Triaxial testing	94
4.5	Axial and volumetric strain data	97
4.6	The Hvorslev surface in rocks	111
CHAPTER 5	TIME DEPENDENCY	
5.1	Creep strain	120
5.2	Phenomenological models of creep	125
5.3	Time-dependent deformation	128
5.4	Time-dependent strength reduction	131
5.5	Cyclic loading	135
5.6	Rapid loading	139
CHAPTER 6	DISCONTINUITIES IN ROCK MASSES	
6.1	Discontinuity measurement	145
6.2	Discontinuity orientation data	148
6.3	Shear resistance of a rock containing a discontinuity	151
6.4	Shear resistance of a discontinuity	158
6.5	A critical state model for rock discontinuity strength	165
6.6	Measurement of discontinuity shear resistance	167
CHAPTER 7	BEHAVIOUR OF ROCK MASSES	
7.1	Discontinuity frequency	169
7.2	Rock mass classification systems	172
7.3	Rock mass strength criterion	184
7.4	The relevance of rock mass strength	189
REFERENCES		193
AUTHOR INDEX		201
SUBJECT INDEX		204