

CHAPTER V

TEST RESULTS

5.1 Introduction

This chapter describes the results of single and multi-stage triaxial compression tests for all rock types. The maximum axial stresses at failure are presented for each confining pressure. The deformation moduli and Poisson's ratios are determined for both test conditions using the three-dimensional stress-strain relations given in Chapter IV. These parameters are calculated from the loading curves at 40-50% of the peak stress.

5.2 Single stage test results

The results of single stage triaxial compression tests conducted under confining pressures (σ_3) ranging from 0 to 40 MPa. They are performed to compare with the multi-stage triaxial tests. Extension failure is observed in high-loading specimens. The high confining pressures result in multiple fractures. Some post-tested single stage specimens are shown in Figure 5.1. The test results are shown as stress-strain curves in Figures 5.2. The elastic moduli and Poisson's ratio are given in Table 5.1.

5.3 Multi-stage test results

The results of multi-stage triaxial compression tests conducted under confining pressures (σ_3) ranging from 0 to 40 MPa. These tests are performed to compare with the single-stage triaxial tests. The specimens exhibit varying failure patterns depending on the applied stress level at each stage. Under confining pressure, deformation was observed to gradually increase as each subsequent step was initiated at a higher confining pressure. All post-tested multi-stage specimens are shown in Figure 5.3. The test results are presented as stress-strain curves in Figures 5.4. The elastic moduli and Poisson's ratio are given in Table 5.2.

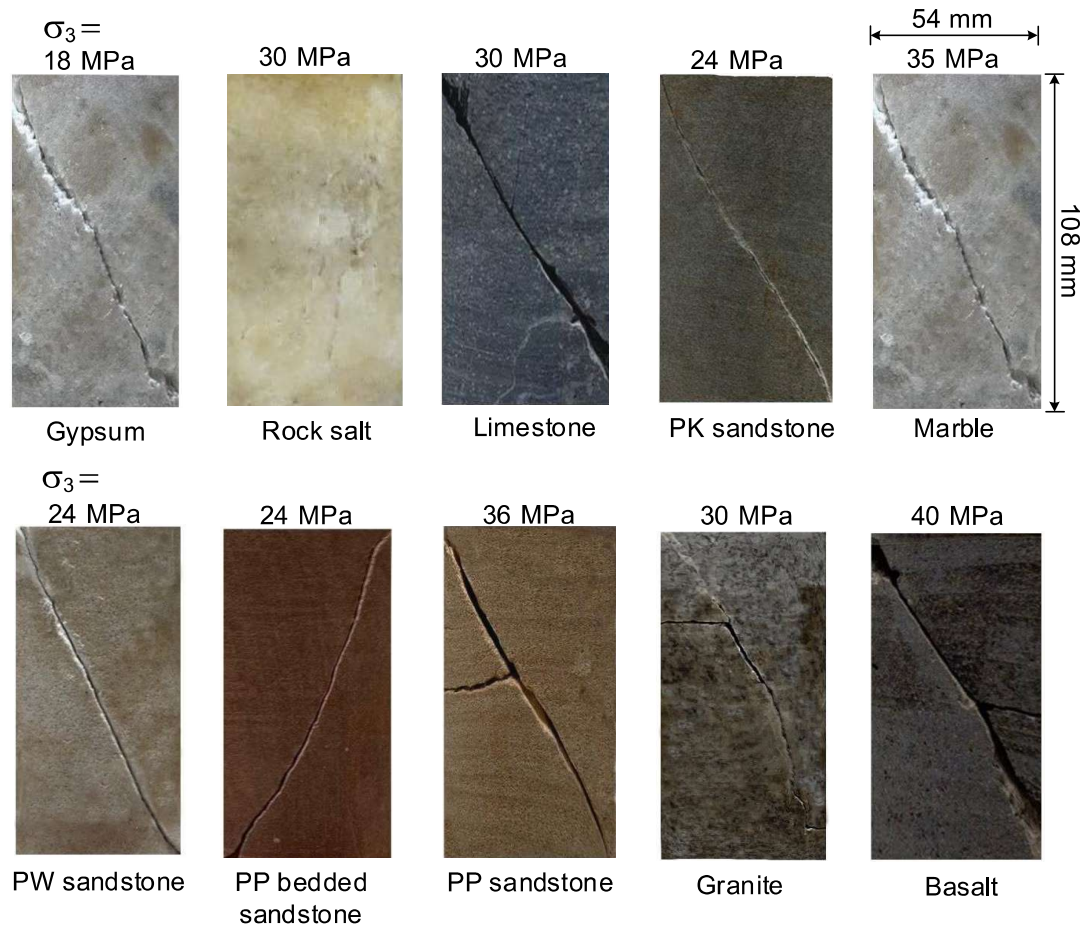


Figure 5.1 Some post-tested specimens of the single stage triaxial compression test.

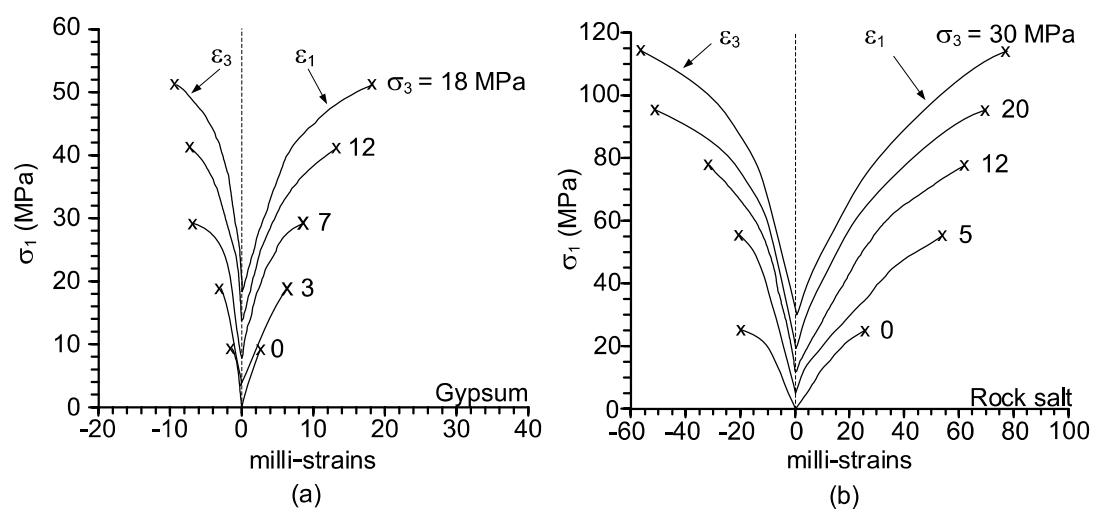


Figure 5.2 Stress-strain curves for Tak Fa gypsum (a), Maha Sarakham salt (b).

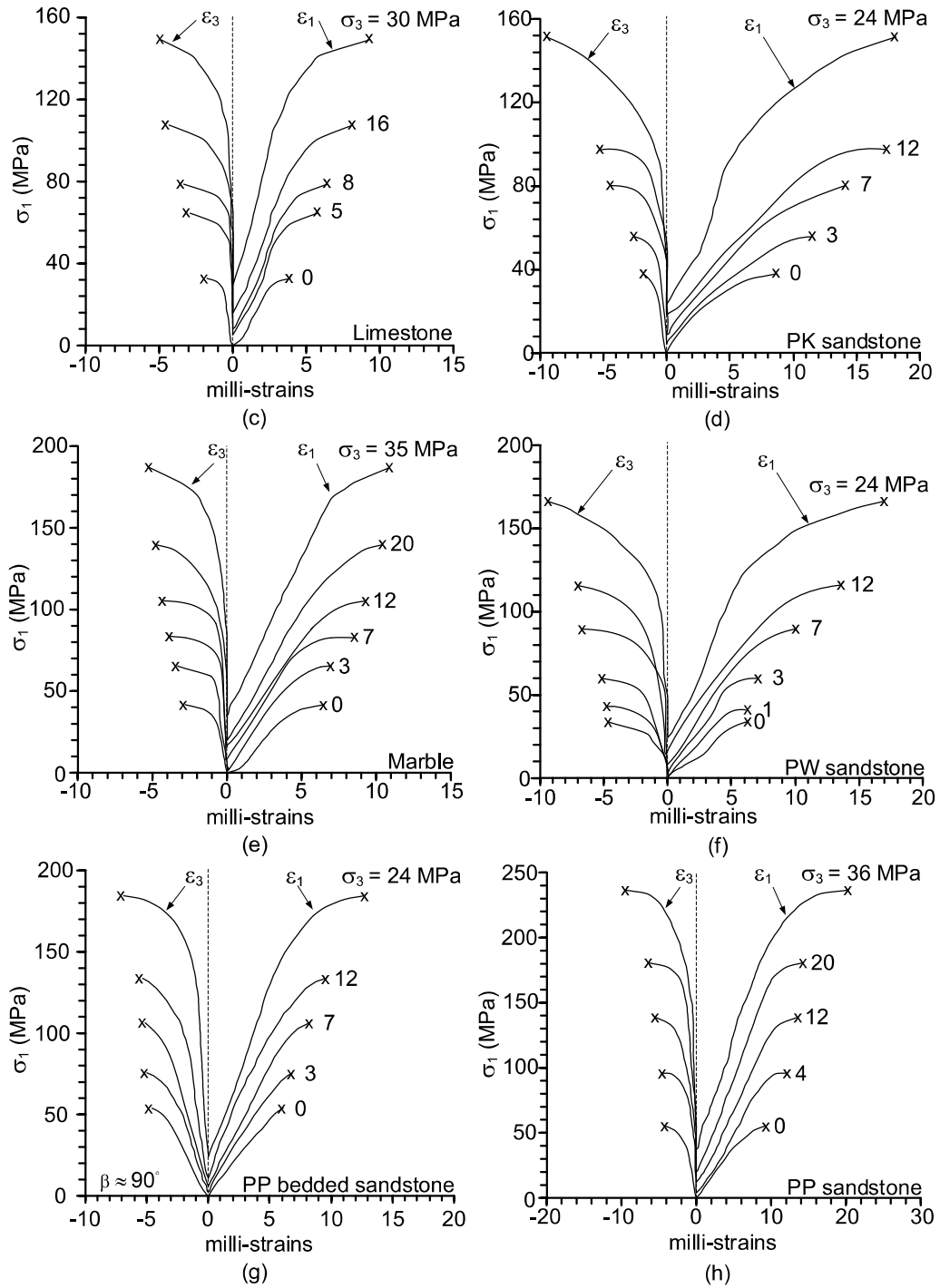


Figure 5.2 Stress-strain curves for Khao Khad bedded limestone (c), Phu Kradung sandstone (d), Khao Khad marble (e), Pha Wihan sandstone (f), Phu Phan bedded sandstone (g), Phu Phan sandstone (h). (cont.)

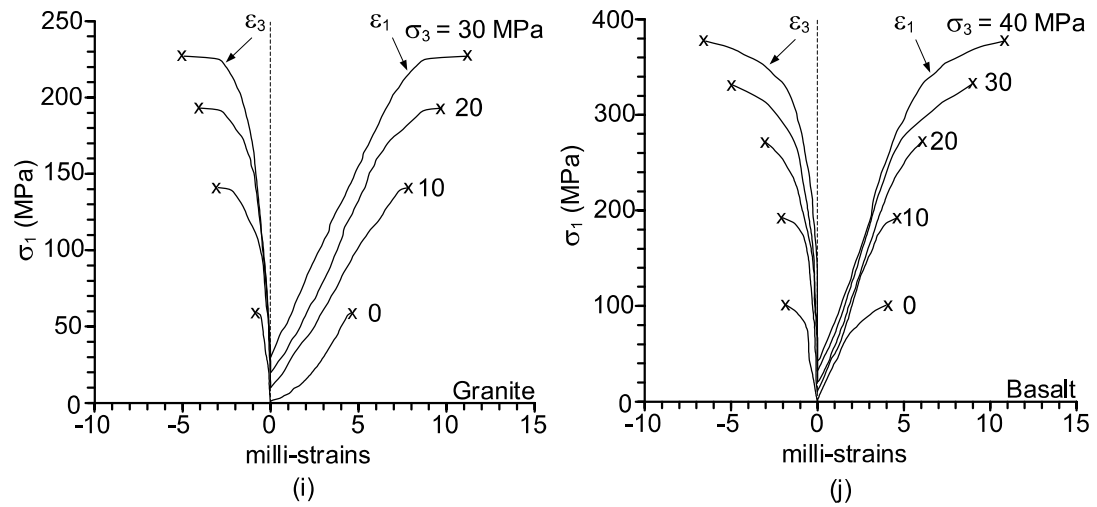


Figure 5.2 Stress-strain curves for Rayong-Bang Lamung granite (i), Buriram basalt (j). (cont.)

Table 5.1 Summary results of Young's moduli, as well as Poisson's ratios of single stage triaxial compression tests.

Rock Types	Confining pressure σ_3 (MPa)	E_s (GPa)	ν_s
Tak Fa gypsum	0	4.6	0.28
	1	-	-
	3	6.0	0.27
	7	8.6	0.26
	12	9.9	0.25
	18	11.5	0.23
Maha Sarakham salt	0	1.2	0.38
	1	-	-
	5	1.6	0.36
	12	2.1	0.33
	20	2.4	0.31
	30	2.5	0.30
Khao Khad bedded limestone	0	12.6	0.24
	1	-	-
	5	17.0	0.20
	8	18.7	0.19
	16	21.6	0.17
	30	27.7	0.15
Phu Kradung sandstone	0	6.5	0.24
	1	-	-
	3	7.2	0.20
	7	9.4	0.19
	12	10.9	0.17
	24	12.3	0.15

Table 5.1 Summary results of Young's moduli, as well as Poisson's ratios of single stage triaxial compression tests. (cont.)

Rock Types	Confining pressure σ_3 (MPa)	E_s (GPa)	ν_s
Khao Khad marble	0	11.3	0.24
	1	-	-
	3	13.3	0.22
	7	15.4	0.20
	12	16.9	0.19
	20	18.7	0.17
	35	21.8	0.15
Pha Wihan sandstone	0	10.4	0.26
	1	-	-
	3	11.3	0.24
	7	13.2	0.22
	12	15.9	0.20
	24	17.5	0.17
Phu Phan bedded sandstone	0	11.6	0.21
	1	-	-
	3	12.2	0.20
	7	12.6	0.19
	12	13.9	0.17
	24	17.2	0.15
Phu Phan sandstone	0	8.3	0.25
	1	-	-
	4	9.7	0.24
	12	12.7	0.23
	20	14.4	0.22
	36	16.9	0.19
Rayong-Bang Lamung granite	0	18.1	0.23
	1	-	-
	5	-	-
	10	20.5	0.21
	20	22.9	0.20
	30	24.6	0.18
Buriram basalt	0	38.1	0.17
	1	-	-
	10	42.6	0.16
	20	45.6	0.15
	30	48.9	0.14
	40	51.4	0.13

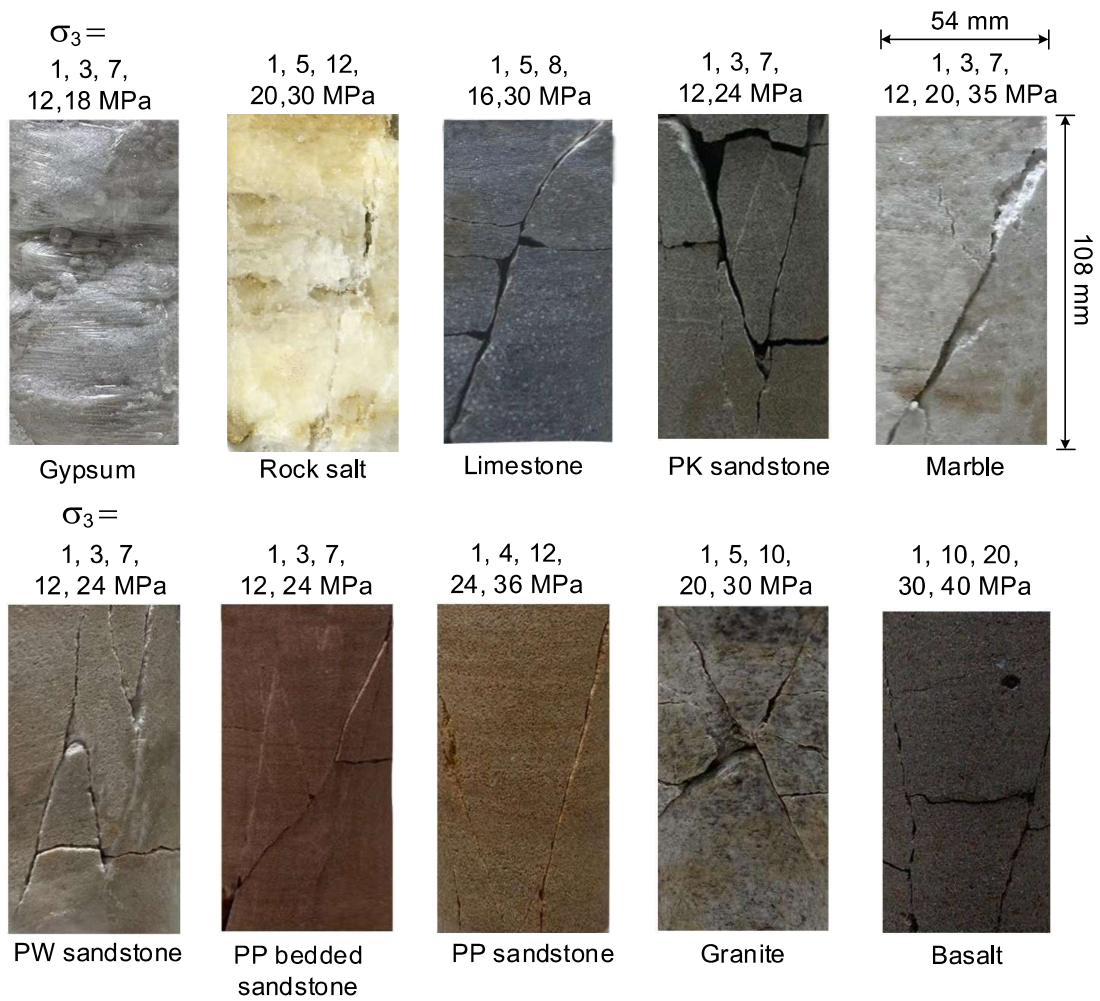


Figure 5.3 All post-tested specimens of multi-stage triaxial compression tests after confining pressure of 1, 3, 4, 5, 7, 8, 10, 12, 16, 18, 20, 24, 30, 35, 36, 40 MPa.

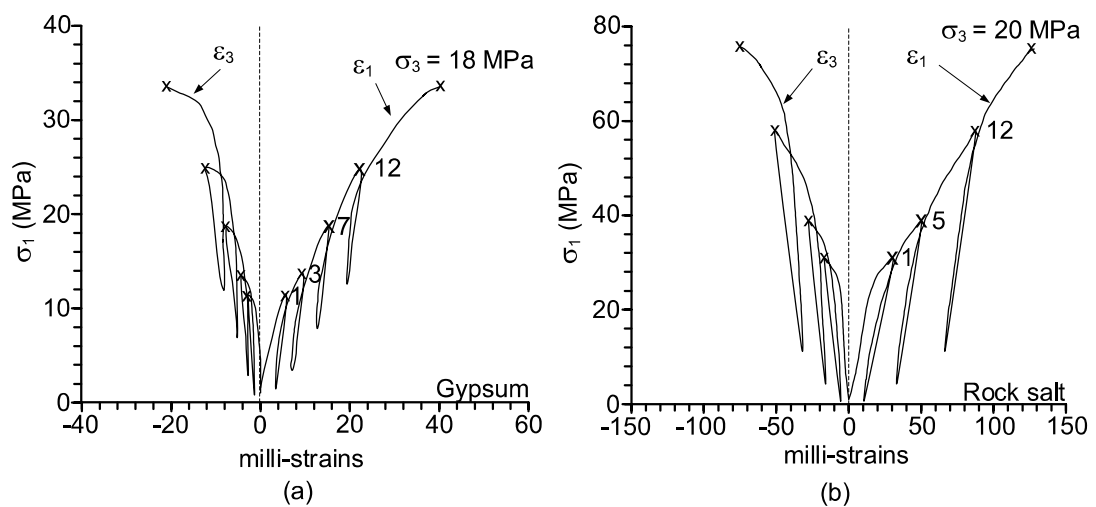


Figure 5.4 Stress-strain curves for Tak Fa gypsum (a), Maha Sarakham salt (b).

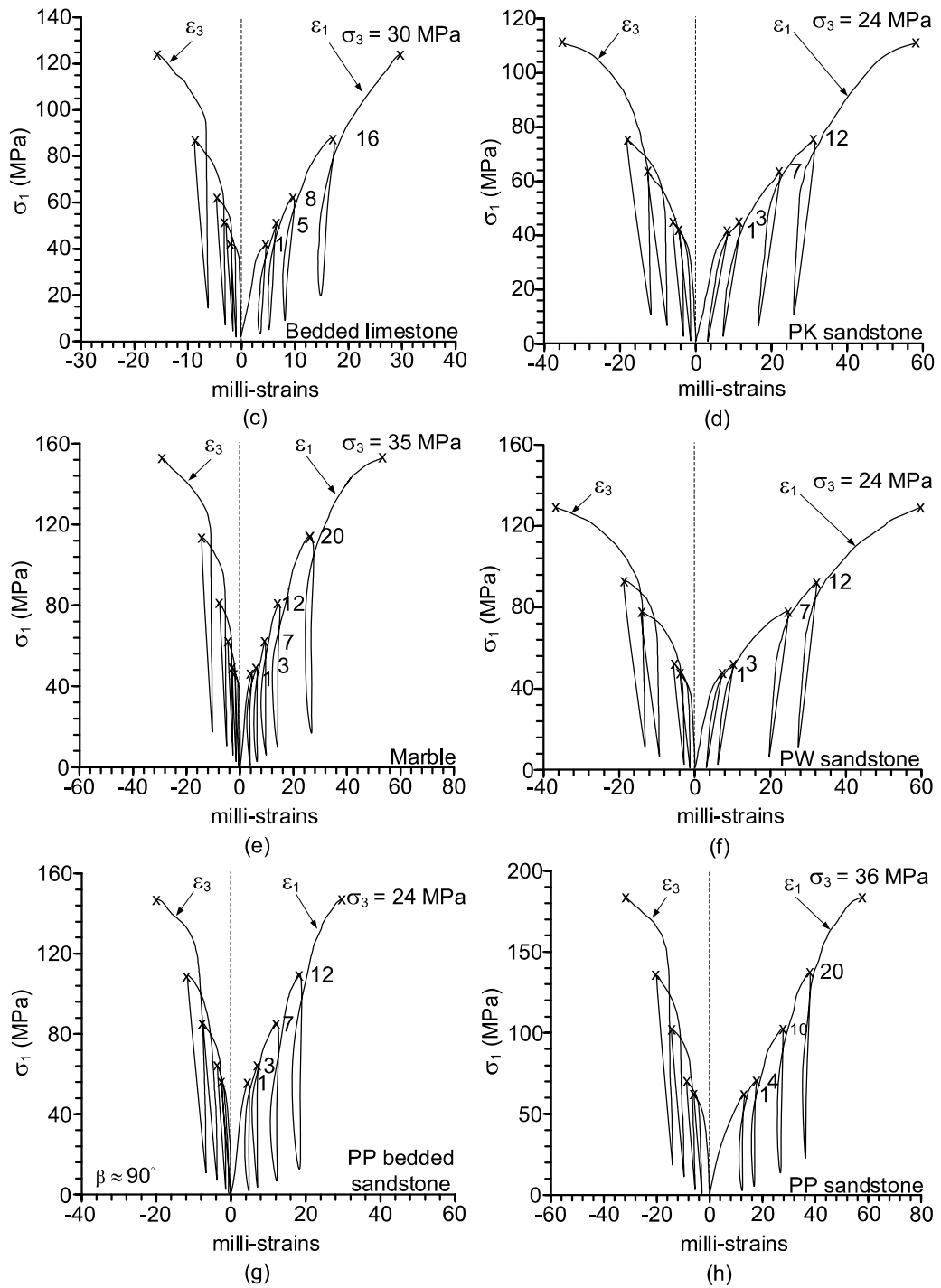


Figure 5.4 Stress-strain curves for Khao Khad bedded limestone (c), Phu Kradung sandstone (d), Khao Khad marble (e), Pha Wihan sandstone (f), Phu Phan bedded sandstone (g), Phu Phan sandstone (h). (cont.)

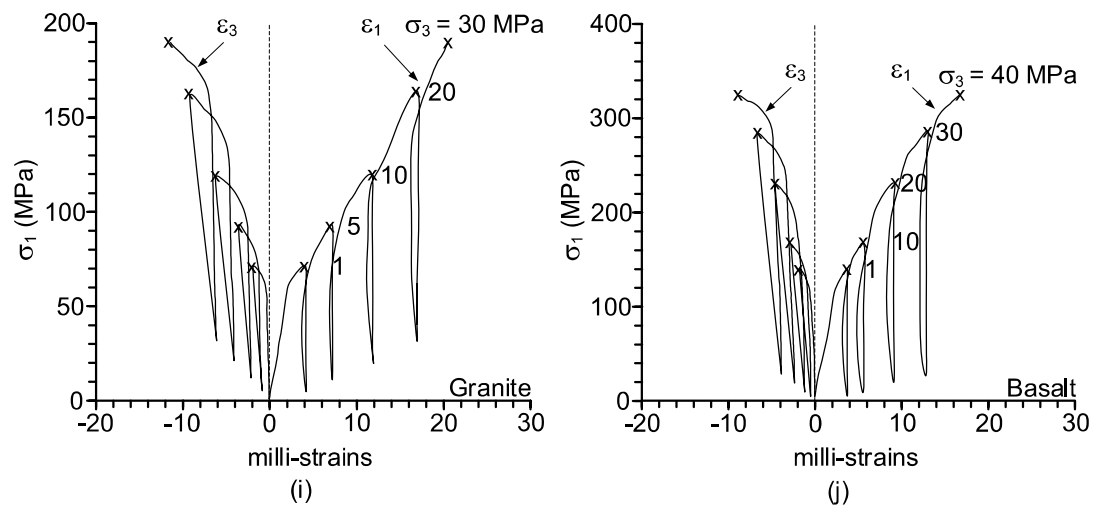


Figure 5.4 Stress-strain curves for Rayong-Bang Lamung granite (i), Buriram basalt (j). (cont.)

Table 5. 2 Summary results of Young's moduli, as well as Poisson's ratios of multi-stage triaxial compression tests.

Rock Types	Confining pressure σ_3 (MPa)	E_m (GPa)	ν_m
Tak Fa gypsum	0	-	-
	1	4.8	0.28
	3	5.9	0.29
	7	7.4	0.30
	12	8.7	0.31
	18	10.8	0.33
Maha Sarakham salt	0	-	-
	1	1.3	0.38
	5	1.4	0.39
	12	2.0	0.40
	20	2.1	0.41
Khao Khad bedded limestone	0	-	-
	1	14.7	0.22
	5	16.7	0.23
	8	17.9	0.24
	16	20.2	0.25
Phu Kradung sandstone	0	-	-
	1	6.7	0.23
	3	7.1	0.24
	7	9.0	0.25
	12	10.3	0.26
	24	11.8	0.28

Table 5.2 Summary results of Young's moduli, as well as Poisson's ratios of multi-stage triaxial compression tests. (cont.)

Rock Types	Confining pressure σ_3 (MPa)	E_m (GPa)	ν_m
Khao Khad marble	0	-	-
	1	11.9	0.23
	3	12.8	0.24
	7	14.7	0.25
	12	16.7	0.26
	20	17.9	0.27
	35	21.1	0.29
Pha Wihan sandstone	0	-	-
	1	10.6	0.25
	3	11.2	0.26
	7	12.7	0.27
	12	14.5	0.28
Phu Phan bedded sandstone	24	17.1	0.31
	0	-	-
	1	11.8	0.21
	3	11.9	0.22
	7	12.2	0.23
Phu Phan sandstone	12	13.4	0.24
	24	16.5	0.25
	0	-	-
	1	8.8	0.25
	4	9.7	0.26
Rayong-Bang Lamung granite	12	11.7	0.27
	20	12.9	0.28
	36	15.6	0.30
	0	-	-
	1	19.4	0.23
Buriram basalt	5	19.9	0.24
	10	20.2	0.25
	20	22.1	0.26
	30	24.3	0.28
	0	-	-
Buriram basalt	1	41.6	0.16
	10	42.3	0.17
	20	43.8	0.18
	30	47.4	0.20
	40	50.9	0.22