

TERM PROJECT

Please use the Modified Cam Clay model (MCC) to simulate the soil behavior under triaxial conditions. Calibration of the model parameters should base on the experimental data as shown below.

1. Experimental Data

A clay has been isotropically consolidated to $p'_0 = 392kPa$ and is then isotropically unloaded to form samples of various overconsolidation ratio (OCR) values. The typical p' and e pairs recorded during the tests are listed below:

$p'(kPa)$	10	20	30	50	100	392	302	98	33
e	1.34	1.32	1.30	1.24	1.17	0.97	0.98	1.00	1.03

Three undrained triaxial compression tests on the clay samples with OCR values of 1.3, 4.0 and 12.0, respectively, where then carried out. During the tests, the lateral total stress σ_3 was kept constant. The test results are listed below:

OCR	$p'(kPa)$	$q(kPa)$	$\varepsilon_1(\%)$
1.3	306	0	0.0
1.3	305	80	0.1
1.3	295	124	0.2
1.3	261	176	0.9
1.3	228	200	2.4
1.3	212	210	6.0
1.3	206	208	8.0
4.0	98	0	0.0
4.0	103	37	0.2
4.0	110	75	0.3
4.0	123	100	0.5
4.0	130	129	1.0
4.0	142	150	1.6
4.0	149	165	2.0
4.0	151	174	3.0
4.0	176	180	8.0
12.0	33	0	0.0
12.0	36	23	0.4
12.0	48	54	1.0
12.0	55	76	1.5
12.0	71	100	2.0
12.0	92	129	3.0
12.0	118	148	4.0
12.0	130	152	6.0
12.0	145	151	8.0

Suppose the Poisson's ratio is 0.25 for the soil.

2. You may use either the built-in MCC model in ABAQUS or PLAXIS or other commercial softwares, or write your own code using the numerical methods in Chapter 5 for the purpose (bonus will be given for the second way).
3. Plot the model predictions together with the test results, including the following plots for each OCR value: p' vs. q , q vs. ε_q , and Δu vs. ε_q .
4. Assume five undrained stress controlled cycles of $q = 200kPa$ peak-to-peak were applied to a normally consolidated sample of the clay soil. During the test, the lateral total stress σ_3 was kept constant. Predict the soil response using the modified Cam-clay computer program. Plot the predicted results in p' vs. q , q vs. ε_q , and Δu vs. ε_q .
5. Prepare a report that includes the following sections:
 - Abstract
 - Introduction of the Modified Cam-Clay model
 - Description of the algorithms used in the ABAQUS or PLAXIS or your own code in relation with the numerical methods in Chapter 5
 - Description of Experimental Data
 - Comparison of experimental data and model predictions
 - Discussion: e.g., comments on the model predictions, reasons for discrepancies, suggestions for improved predictions. Cite necessary references to support your arguments.
 - Conclusion
 - References