Abstract

Much software used in geothecnic is written under Morh Coulomb criterion, one of the most known models for this applications and results. To use this model it is only necessary to introduce two parameters, which are the cohesion and friction angle. This is the reason of these notes; I'm going to try to create another alternative that allows the use of other terrain's parameters.

The field of this work is rock's mechanics and how the failure and the evolution of the rock is when it is under variation loads. The objective is to try to use another failure criterion more complete and real with the terrain's parameters, which uses more than two parameters and considerates something else, for example: the excavation process…
I'm going to use the generalized Hoek & Brown criteria, a non lineal method that represents the failure with a curve, born from empirical observations and its worth to value the rock matrix strength.

The new constitutive soil model will be implemented at Plaxis version 8. The model must be programmed in Fortran, or another programming language, then compiled as DLL and added to Plaxis like a user-define soil model.

The first chapters are dedicated to explain all the concepts necessary to understand the text. I will revise the elastic and plastic theory superficially and I will explain the generalized Hoek & Brown criteria in detail and the relationship with Morh Coulomb criterion.

To carry out the numerical implementation of constitutive law, the first step is creating the elastoplastic numerical algorithm under Fortran language by using Maple. It is written under Backward Euler Return method.

Hoek & Brown yield surface it is a hexagonal pyramid. Note that the edges of the pyramid are singular and not derivable points. This causes some mathematical problems. For this reason we use another yield surface (F_{smooth}) around the edges. This yield surface eliminates the singular tip from Hoek & Brown surface. This type of yield surface is both continuous and differentiable at all stress states. Then, the algorithm is going to be made valid like a constitutive law. It has been used two examples to do it. The results are compared with the results of RocData (RocScience Inc, 2004).

Then, the new constitutive soil model is implemented at Plaxis version 8. To make it possible, a new subroutine is created under Fortran language. Plaxis use this subroutine like a guide during the calculation process. Finally, the new soil model is used to calculate a tunnel. The example selected is Bracons's tunnel. The results are compared with Morh Coulomb criterion.