SSNV136 - Triaxial compression test drained with model CJS (level 2)

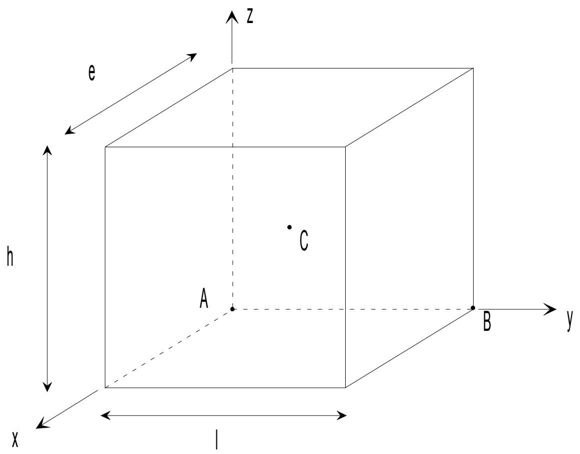
Summary

This test makes it possible to validate level 2 of model CJS. It is about a triaxial compression test in drained condition. Calculations are carried out only on the solid part of the ground, without hydraulic coupling. The level of containment is of $100\,kPa$.

By reason of symmetry, one is interested only in the eighth of a sample 3D subjected to a triaxial compression test.
It is about a test of nonregression. Nevertheless, results got with *Code_Aster* for model CJS2 are compared with those obtained with a private version of the software SPLASH -2D.

1 Problem of reference

1.1 Geometry



height: $h=1\,m$
width: $l=1\,m$
thickness: $e=1\,m$

Coordinates of the points (in meters):

	A	B	C
x	0.	0.	0.5
y	0.	1.	0.5
z	0.	0.	0.5

1.2 Material property

$E=35{,}661654110^3\,kPa$
$\nu=0{,}15037594$

Parameters CJS2: $\beta=-0{,}55$ $\gamma=0{,}82$ $R_m=0{,}289$ $R_c=0{,}265$ $n=0{,}6$
$K_o^p=25{,}5\,10^3\,kPa$ $A=0.25\,kPa$ $P_a=-100\,kPa$

1.3 Initial conditions, boundary conditions, and loading

Phase 1:

One brings the sample in a homogeneous state: $\sigma_{xx}^0=\sigma_{yy}^0=\sigma_{zz}^0$, by imposing the corresponding confining pressure on the front, side right-hand side and higher faces. Displacements are blocked on the faces postpones ($u_x=0$), side left ($u_y=0$) and lower ($u_z=0$).

Phase 2:

One maintains displacements blocked on the faces postpones ($u_x=0$), side left ($u_y=0$) and lower ($u_z=0$), as well as the confining pressure on the front faces and side right-hand side. One applies a displacement imposed to the higher face: $u_z(t)$, in order to obtain a deformation $\varepsilon_{zz}=-20\,\%$ (counted starting from the beginning of phase 2).

2 Reference solution

2.1 Method of calculating used for the reference solution

The results got with the software a private version of the Flac-2D software are used as reference.

2.2 Results of reference

Constraints σ_{xx} , σ_{yy} and σ_{zz} at the points A , B and C .

2.3 Uncertainty on the solution

Uncertainty related to the Flac-2D software.

2.4 Bibliography

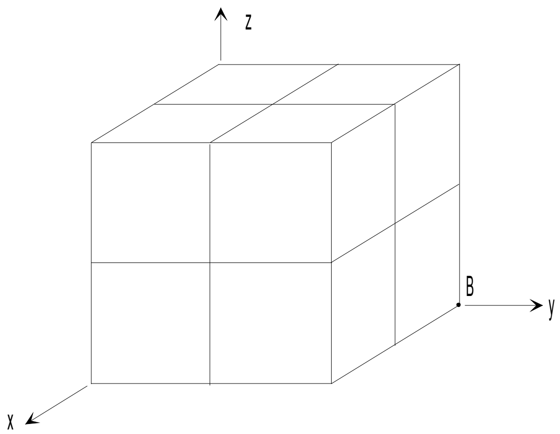
1 Board, “SPLASH (Fast Lagrangian Analysis of Continua) Version 2.20. U.S. NRC”, NUREG/CR-5430, October 1989.

2 “Splash Fast Lagrangian Analysis of Continua. Theory and Background.” Itasca Consulting Group.

3 Modeling A

3.1 Characteristics of modeling

3D:



Cutting: 2 in height, in width and thickness.

Loading of phase 1:

Confining pressure: $\sigma_{xx}^0 = \sigma_{yy}^0 = \sigma_{zz}^0$: successively $-100\,kPa$, $-200\,kPa$ and $-400\,kPa$.

Level 2 of model CJS

3.2 Characteristic of the grid

Many nodes: 27
Many meshs and types: 8 HEXA8 and 24 QUA4

3.3 Values tested

For $\sigma_{xx}^0 = \sigma_{yy}^0 = \sigma_{zz}^0$: $-100\,kPa$

Localization	Sequenc e number	axial deformation ε_{zz} (%)	constraint (kPa)	Reference
Not A, B and C		– 0.8%	σ_{xx}	– 100.0
		– 20.0%	σ_{xx}	– 100.0
		– 0.8%	σ_{yy}	– 100.0
		– 20.0%	σ_{yy}	– 100.0
		– 0.8%	σ_{zz}	– 286.8
		– 1.6%	σ_{zz}	– 332.9
		– 3.2%	σ_{zz}	– 350.8
		– 7.2%	σ_{zz}	– 356.1
		– 20.0%	σ_{zz}	– 358.8

4 Summary of the results

Values of the constraints obtained with *Aster* coincide with those of the software SPLASH with a lower deviation than 0.05%.