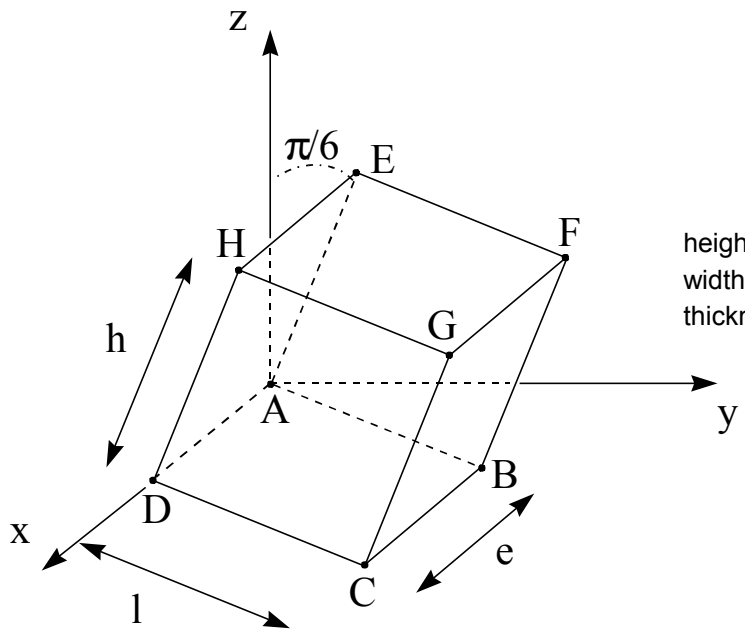
SSNV155 - Triaxial compression test drained on a turned sample of an angle of – PI/6 compared to axis X with the model CJS (level 2)

Summarized

This test makes it possible to supplement the validation of level 2 of model CJS already approached in the case test SSNV136. It corresponds to the computational simulation of the same test (drained triaxial compression test) on the same material but with a different geometry. The sample tested is thus turned of an angle of $-\pi/6$ compared to the axis x. Consequently, the directions x, y, z are not any more principal directions. That makes it possible to validate the operations of numerical integration of the model which act on the nondiagonal terms of the tensors of the strains and the stresses.
As for the case test SSNV136, computations are carried out only on the solid part of the soil, without hydro-mechanical coupling. By reason of symmetry, one is interested only in the eighth of a sample subjected to a triaxial compression test. The level of containment is of $400\,kPa$.
It is about a test of non regression. The got results are compared with those provided by an Aster computation with a mesh whose axes of symmetry are the axes of coordinates. They correspond to them exactly with the rotation of angle $-\pi/6$ near.

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	D
x	0.	0.	1.	1.
y	0.	0.86602540378445	0.86602540378445	0.
z	0.	– 0.5	– 0.5	0.

1.2 Material property

$E=35{,}6616541\,10^{3}\,kPa$
$\nu=0{,}15037594$
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, by imposing the corresponding confining pressure on the sides $EFGH$, $CDHG$ and $BCGF$. Normal displacements are blocked on sides ABCD, $ADHE$ and $ABFE$.

Phase 2:
One maintains displacements normal blocked on the sides $ABCD$, $ADHE$ and $ABFE$; as well as the confining pressure on the sides $CDHG$ and $BCGF$. One applies a normal displacement imposed to the face $EFGH$, in order to obtain a strain according to the normal direction equal to -20% (counted starting from the beginning of the phase 2).

2 Reference solution

2.1 Method of calculating used for the reference solution

By taking account of the rotation of angle of the sample, the results got by an Aster computation with a mesh whose axes of symmetry are the axes of coordinates, are used as reference.

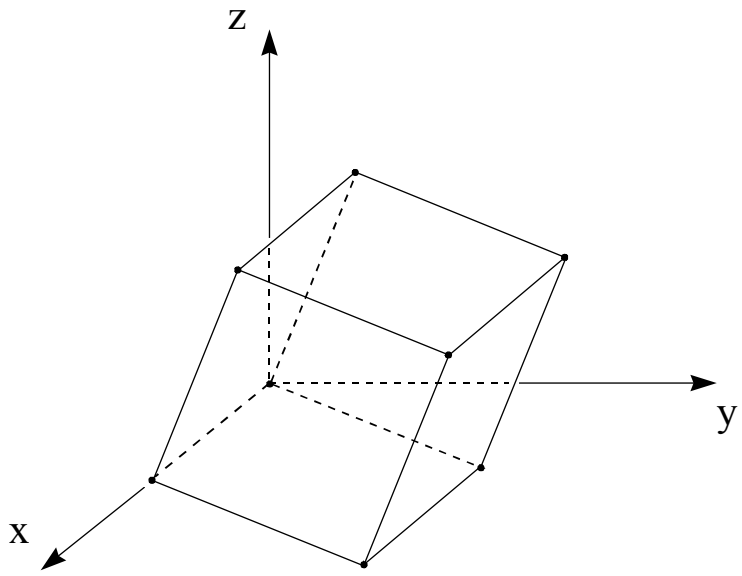
2.2 Forced results of

reference σ_{xx} σ_{yy}, σ_{zz} and σ_{yx} with the point A.

3 Modelization A

3.1 Characteristic of the modelization

3D :



Cutting: 1 in height, in width and thickness.

Loading of phase 1:
Confining pressure: $-400\,kPa$.
Level 2 of model CJS

3.2 Characteristic of the mesh

Many nodes: 8
Number of meshes and types: 1 HEXA8 and 6 QUA4

3.3 Quantities tested and results

For containment: $-400\,kPa$

Localization	Sequence number	axial strain ε_{zz} (%)	Forced (kPa)	Reference	*Aster*	% difference
Not A		– 2.0%	σ_{xx}	– 400.0	– 400.000	< 10-6
		– 10.0%	σ_{xx}	– 400.0	– 400.000	< 10-6
		– 20.0%	σ_{xx}	– 400.0	– 400.000	< 10-6
		– 2.0%	σ_{yy}	– 54.0613	– 54.061292	< 10-6
		– 10.0%	σ_{yy}	– 63.5278	– 63.527785	< 10-6
		– 20.0%	σ_{yy}	– 65.0989	– 65.098864	< 10-6
		– 2.0%	σ_{zz}	– 82.1839	– 82.18387	< 10-6
		– 10.0%	σ_{zz}	– 110.583	– 110.58335	< 10-6
		– 20.0%	σ_{zz}	– 115.297	– 115.29659	< 10-6
		– 2.0%	σ_{yz}	– 24.3549	– 24.354871	< 10-6
		– 10.0%	σ_{yz}	– 40.7513	– 40.751319	< 10-6
		– 20.0%	σ_{yz}	– 43.4725	– 43.472508	< 10-6

4 Summary of the results

the results are into perfect agreement with those of the reference.