WTNV135 - Triaxial compression test drained with the model LETK of the ClH

Summarized

This test makes it possible to the model validate LETK in the frame of a hydraulic modelization. It is about a triaxial compression test in drained condition.

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 $5 MPa$.

Modelization A: Integration of the model by an explicit diagram, with the classical modelization.

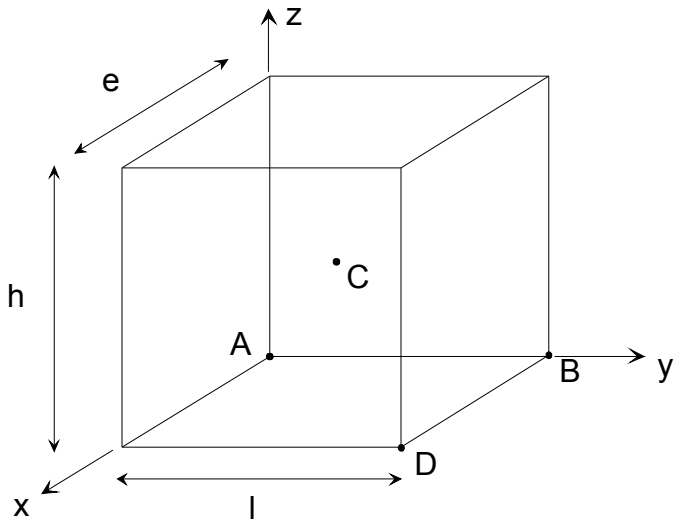
Modelization b: Integration of the model by implicit scheme whose jacobian matrix is obtained by disturbance, with the classical modelization.

Modelization C: Integration of the model by implicit scheme whose jacobian matrix is obtained analytically, with the classical modelization.

Modelization D: Integration of the model by an explicit diagram, with the under-integrated modelization.

1 Problem of reference

1.1 Geometry



hauteur : h = 1 m
largeur : l = 1 m
épaisseur : e = 1 m

Coordinated of the points (in meters):

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

1.2 Material property

$E = 5000\,MPa$
$\nu = 0.12$
$\alpha = 0.$
$Pa = 0.1\,MPa$
$n_{elas} = 0.$
$\sigma_c = 12.\,MPa$
$H_0^{ext} = 1.10292$
$\gamma_{cjs} = 0.8$
$x_{ams} = 0,1$
$\eta = 0.04$
$a_0 = 0.25$
$a_e = 0.60$
$a_{pic} = 0.40$
$s_0 = 0.0005$
$m_0 = 0.01$
$m_e = 2.$
$m_{pic} = 6.$
$m_{ult} = 0.61$
$\xi_{ult} = 0.365$
$\xi_e = 0.028$
$\xi_{pic} = 0.015$
$m_{v-\max} = 3.$
$\xi_{v-\max} = 0.0039$
$A^v = 1.510^{-12}\,Pa$
$n^v = 4.5$
$\sigma_{p1} = 57.8\,MPa$
$\mu_{0,v} = 0,1$
$\xi_{0,v} = 0,3$
$\mu_1 = 0,1$
$\xi_1 = 0,3$

1.3 Initial conditions, boundary conditions, and loading

Phase 1:
One brings the sample in a homogeneous state: $\sigma^0_{xx}=\sigma^0_{yy}=\sigma^0_{zz}$, by imposing the corresponding confining pressure on the front, side right and higher sides. Displacements are blocked on the sides postpones ($u_x=0$), side left ($u_y=0$) and lower ($u_z=0$).

Phase 2:
One maintains displacements blocked on the sides postpones ($u_x=0$), side left ($u_y=0$) and lower ($u_z=0$). On all the sides, the pressure of water is null.

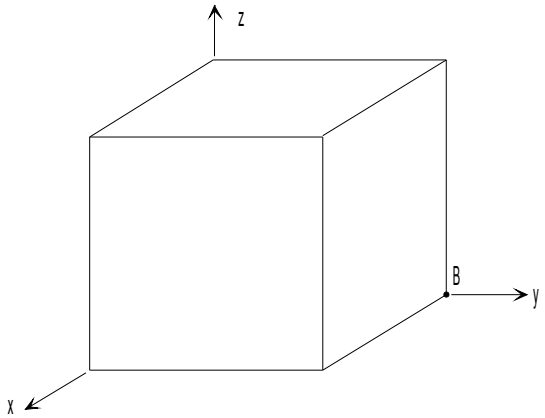
One applies a displacement forced to the upper face in order to 2) obtain $\varepsilon_{zz}=-6$ a strain (counted starting from the beginning of the phase. On the front sides and side right, one imposes a stress of $5\ MPa$.

2 Reference solutions

the values of reference are obtained by NON-regression. A finer discretization of the loading ensures the convergence of the values a limited value.

3 Modelization A

3.1 Characteristic of the modelization



Cutting: 1 in height, in width and thickness.

Loading of phase 1:
Confining pressure: $\sigma_{xx}^0 = \sigma_{yy}^0 = \sigma_{zz}^0 : -5\,MPa$.
Coefficient of biot: 1
UN_SUR_K of water: 0
Modelization: 3D_HM

3.2 Characteristic of the mesh

Many nodes: 20
Number of meshes and types: 1 HEXA20 and 6 QUA8

3.3 Quantities tested and results

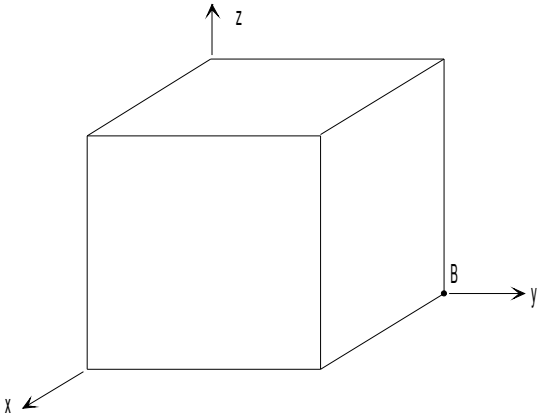
the values are tested in NON-regression with a given accuracy of $0,1\,\%$

Localization	Time	Aster	*Displacement*
Not C	13000.	DX	3.019 10-2

Forced	Localization	Time (MPa)	*Aster*
Not C	13000.	σ_{zz}	-11.941

4 Modelization B

4.1 Characteristic of the modelization



Cutting: 1 in height, in width and thickness.

Loading of phase 1:
Confining pressure: $\sigma^0_{xx}=\sigma^0_{yy}=\sigma^0_{zz}$: $-5\,MPa$.
Coefficient of biot: 1
UN_SUR_K of water: 0
Modelization: 3D_HM

4.2 Characteristic of the mesh

Many nodes: 20
Number of meshes and types: 1 HEXA20 and 6 QUA8

4.3 Quantities tested and results

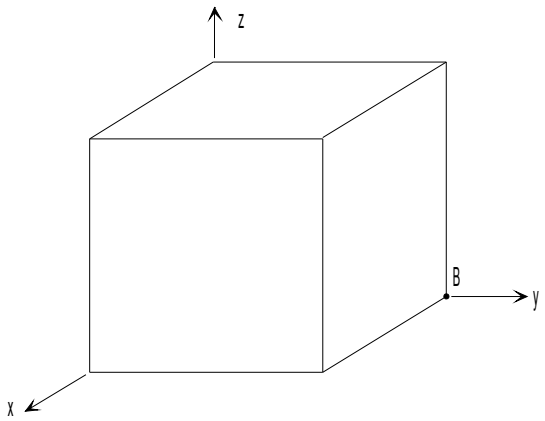
the values are tested in NON-regression with a given accuracy of $0,1\%$

Localization	Time	Aster	*Displacement*
Not C	13000.	DX	3.026 10-2

Forced	Localization	Time (MPa)	*Aster*
Not C	13000.	σ_{zz}	-11.94

5 Modelization C

5.1 Characteristic of the modelization



Cutting: 1 in height, in width and thickness.

Loading of phase 1:
Confining pressure: $\sigma^0_{xx}=\sigma^0_{yy}=\sigma^0_{zz}$: $-5\,MPa$.
Coefficient of biot: 1
UN_SUR_K of water: 0
Modelization: 3D_HM

5.2 Characteristic of the mesh

Many nodes: 20
Number of meshes and types: 1 HEXA20 and 6 QUA8

5.3 Quantities tested and results

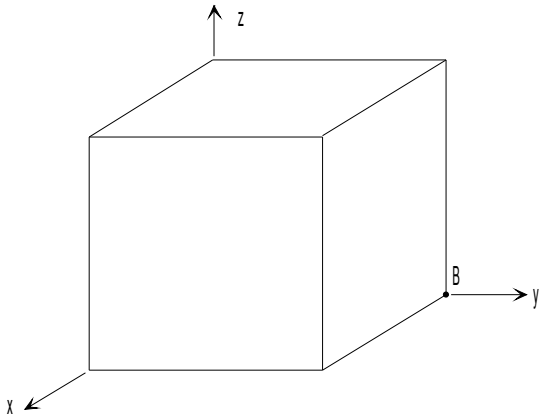
the values are tested in NON-regression with a given accuracy of $0,1\%$

Localization	Time	Aster	*Displacement*
Not C	13000.	DX	3.026 10-2

Forced	Localization	Time (MPa)	*Aster*
Not C	13000.	σ_{zz}	-11.94

6 Modelization D

6.1 Characteristic of the modelization



Cutting: 1 in height, in width and thickness.

Loading of phase 1:
Confining pressure: $\sigma^0_{xx}=\sigma^0_{yy}=\sigma^0_{zz}$: $-5\,MPa$.
Coefficient of biot: 1
UN_SUR_K of water: 0
Modelization: 3D_HM_SI

6.2 Characteristic of the mesh

Many nodes: 20
Number of meshes and types: 1 HEXA20 and 6 QUA8

6.3 Quantities tested and results

the values are tested in NON-regression with a given accuracy of $0,1\%$

Localization	Time	Aster	*Displacement*
Not C	13000.	DX	3.019 10-2

Forced	Localization	Time (MPa)	*Aster*
Not C	13000.	σ_{zz}	-11.941

7 Summary of the results

This case test is a test of non regression developed the model to validate LETK in hydromechanics in conditions drained for two distinct diagrams of integration. The results are identical to those obtained in test SSNV206 for the two diagrams.