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

Summary

This test makes it possible to validate the model LETK within the framework of a hydraulic modeling. 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 $5 MPa$.

Modeling A: Integration of the model by an explicit diagram, with classical modeling.

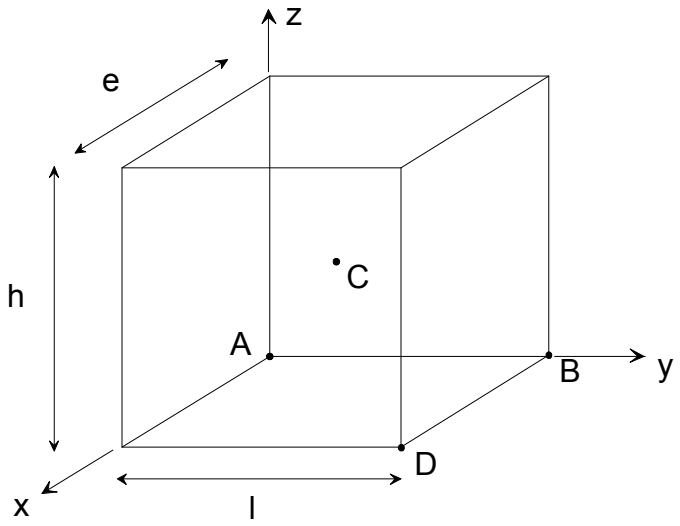
Modeling b: Integration of the model by implicit scheme whose matrix jacobienne is obtained by disturbance, with classical modeling.

Modeling C: Integration of the model by implicit scheme whose matrix jacobienne is obtained analytically, with classical modeling.

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

1 Problem of reference

1.1 Geometry



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

Coordinates 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

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

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-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 ($u_z=0$). On all the faces, the pressure of water is worthless.

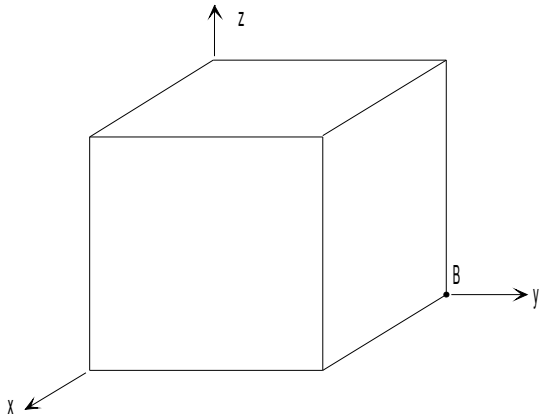
One applies a displacement forced to the higher face in order to obtain a deformation $\varepsilon_{zz}=-6$ (counted starting from the beginning of phase 2). On the front faces and side right-hand side, one imposes a constraint of $5\,MPa$.

2 Reference solutions

The values of reference are obtained by not-regression. A finer discretization of the loading ensures the convergence of the values a limited value.

3 Modeling A

3.1 Characteristics of modeling



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 water: 0
Modeling: 3D_HM

3.2 Characteristics of the grid

Many nodes: 20
Many meshs and types: 1 HEXA20 and 6 QUA8

3.3 Sizes tested and results

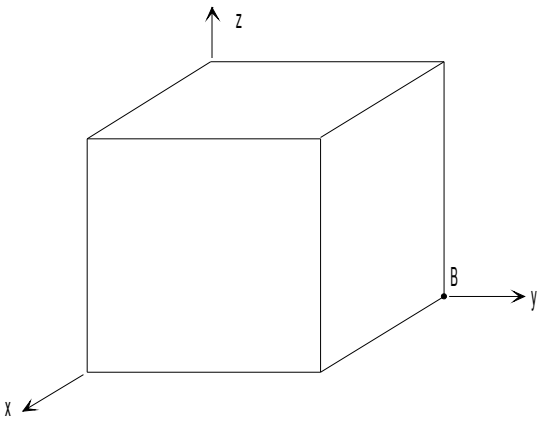
The values are tested in not-regression with a precision given of $0,1\,\%$

Localization	Moment	Displacement	*Aster*
Not C	13000.	DX	3,019 10^{-2}

Localization	Moment	Constraint (MPa)	*Aster*
Not C	13000.	σ_{zz}	-11,941

4 Modeling B

4.1 Characteristics of modeling



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 water: 0
Modeling: 3D_HM

4.2 Characteristics of the grid

Many nodes: 20
Many meshs and types: 1 HEXA20 and 6 QUA8

4.3 Sizes tested and results

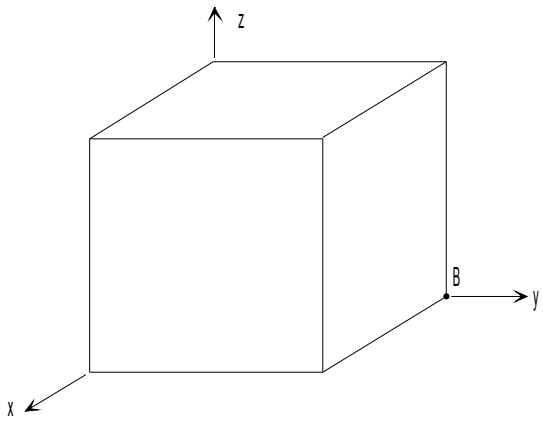
The values are tested in not-regression with a precision given of $0,1\%$

Localization	Moment	Displacement	*Aster*
Not C	13000.	DX	3,026 10^{-2}

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

5 Modeling C

5.1 Characteristics of modeling



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 water: 0
Modeling: 3D_HM

5.2 Characteristics of the grid

Many nodes: 20
Many meshs and types: 1 HEXA20 and 6 QUA8

5.3 Sizes tested and results

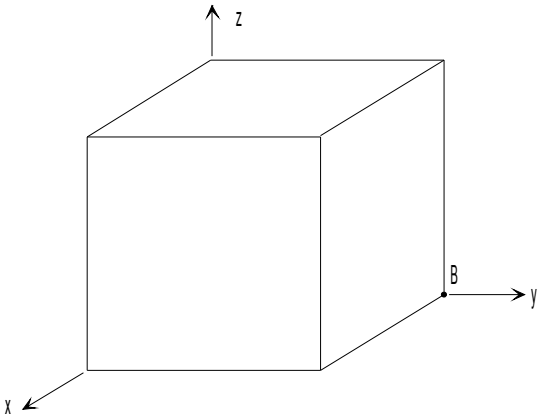
The values are tested in not-regression with a precision given of $0,1\%$

Localization	Moment	Displacement	*Aster*
Not C	13000.	DX	3,026 10^{-2}

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

6 Modeling D

6.1 Characteristics of modeling



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 water: 0
Modeling: 3D_HM_SI

6.2 Characteristics of the grid

Many nodes: 20
Many meshs and types: 1 HEXA20 and 6 QUA8

6.3 Sizes tested and results

The values are tested in not-regression with a precision given of $0,1\%$

Localization	Moment	Displacement	Aster
Not C	13000.	DX	3,019 10^{-2}

Localization	Moment	Constraint (MPa)	Aster
Not C	13000.	σ_{zz}	-11,941

7 Summary of the results

This case test is a test of nonregression developed to validate the model 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.