WTNV135 - Drained triaxial compression test: modelS LETK and LKR

Summary

This test makes it possible to validate itS modelS LETK and LKR 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 $5MPa$.

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

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

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

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

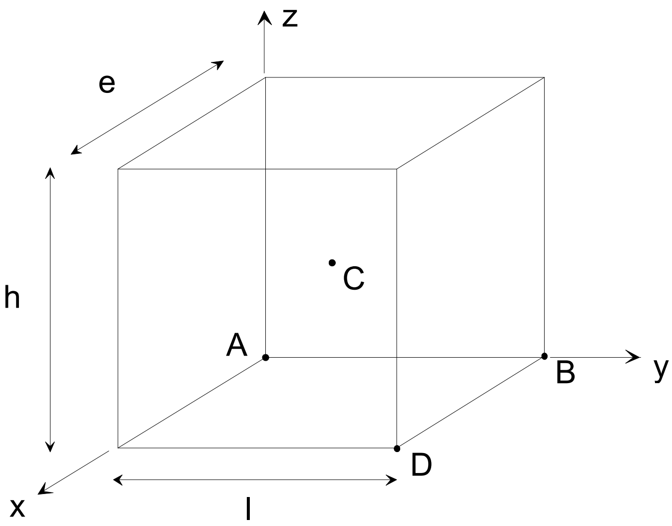
Modeling E : Integration of the model by an explicit diagram, with classical modeling, increasing temperature 0°C-100°C (AFFE_CHAR_MECA) : model LKR.

Modeling F : Integration of the model by implicit scheme whose matrix jacobienne is obtained by disturbance, increasing temperature 0°C-100°C (AFFE_CHAR_MECA) : model LKR.

Modeling G : Integration of the model by implicit scheme whose matrix jacobienne is obtained analytically, increasing temperature 0°C-100°C (AFFE_CHAR_MECA) : model LKR.

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 PropertyS materials for model LETK

Pa	= 0.1
NELAS	= 0.
SIGMA_C	= 12.
H0_EXT	= 1.10292
GAMMA_CJS	= 0.8
XAMS	= 0.1
ETA	= 0.04
A_0	= 0.25
A_E	= 0.60
A_PIC	= 0.4
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
MV_MAX	= 3.
XIV_MAX	= 0.0039
With	= 1.5e-12
NR	= 4.5
SIGMA_P1	= 57.8
MU0_V	= 0.1
XI0_V	= 0.3
MU1	= 0.1
XI1	= 0.3

1.3 PropertyS materials for model LKR

Pa	= .1	
NELAS	= 0.	
SIGMA_C	= 12.	
BETA	= 1.5	
GAMMA	= .8	
V_1	= 2.1	
V_2	= 2.2	
A_2	= .65	
M_0	= .1	
M_1	= 4.1	
Q_I	= 45.	
XI_1	= .017	
XI_2	= .030	
XI_5	= .0039	
F_P	= .1	
With	= 1.5e-13	
NR	= 4.5	
RHO_1	= .1	
RHO_2	= 2.	
RHO_4	= .3	
R_Q	= 0.	(except for modelings I and J, = 1.e-4)
R_M	= 0.	(except for modelings I and J, = 1.e-4)
R_S	= 0.	(except for modelings I and J, = 1.e-3)
R_X1	= 0.	(except for modelings I and J, = 1.e-2)
R_X2	= 0.	(except for modelings I and J, = 1.e-2)
R_X5	= 0.	(except for modelings I and J, = 1.e-2)
Z	= 0.	(except for modelings I and J, = 1000.)
COUPLAGE_P_VP	= 1.	(except for modeling H, = 0.)

1.4 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 ($u_z=0$). 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 $5\,MPa$.

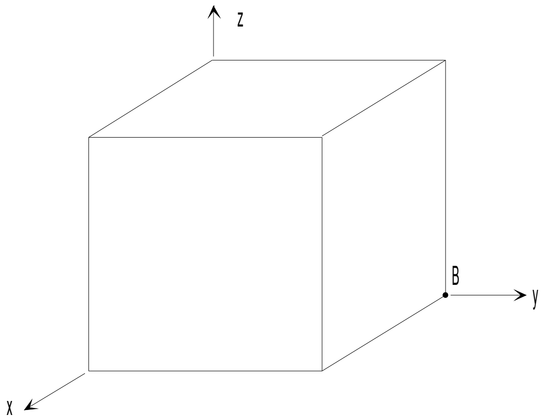
For modelings E, F and G, an increasing temperature is imposed via the order `AFFE_CHAR_MECA` between 0°C and 50°C in phase 1 and 50°C and 100°C in phase 2.

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.
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

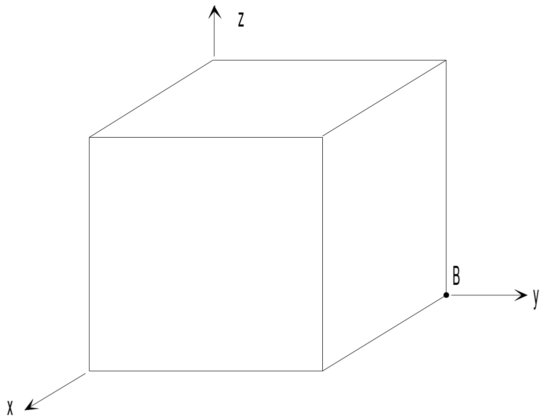
The values are tested in not-regression with a precision given of $0,1\%$

Localization	Moment	Displacement (m)	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.
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

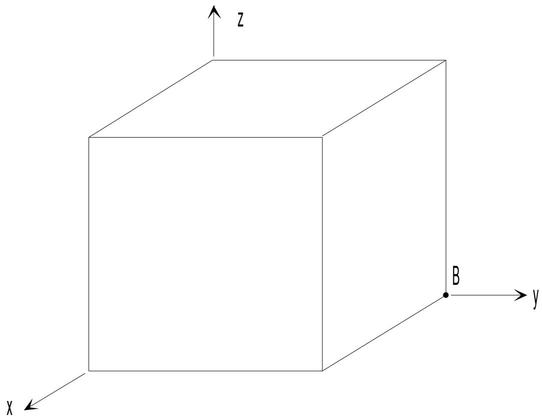
The values are tested in not-regression with a precision given of $0{,}1\%$

Localization	Moment	Displacement (m)	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.
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

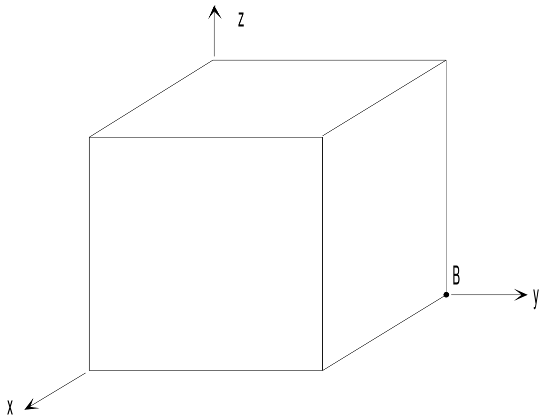
The values are tested in not-regression with a precision given of $0,1\%$

Localization	Moment	Déplacement (m)	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.
Modeling: `3D_HM_ IF`

6.2 Characteristics of the grid

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

6.3 Sizes tested and results

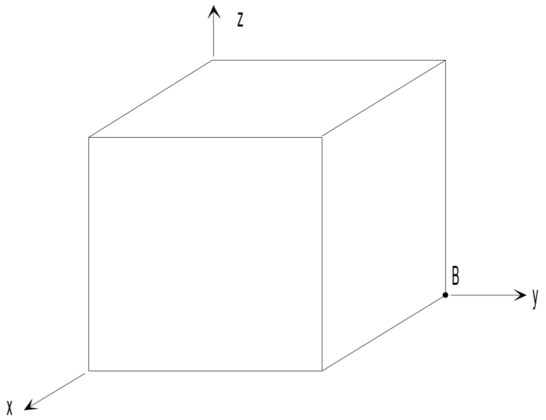
The values are tested in not-regression with a precision given of $0,1\%$

Localization	Moment	Déplacement (m)	Aster
Not C	13000.	DX	3,019 10-2

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

7 Modeling E

7.1 Characteristics of modeling



Cutting: 1 in height, in width and thickness.
Modeling: `3D_HM`

7.2 Characteristics of the grid

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

7.3 Sizes tested and results

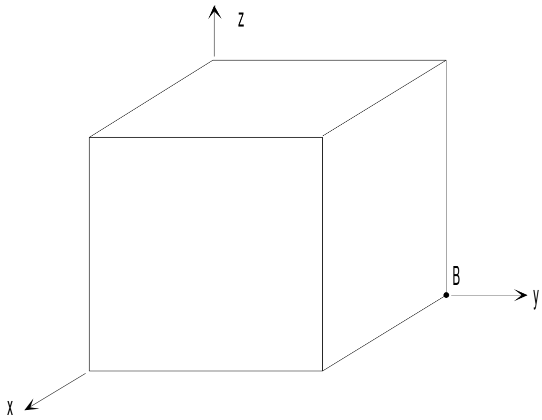
The values are tested in not-regression with a precision given of $0{,}1\%$

Localization	Moment	Déplacement (m)	Aster
Not C	13000.	DX	3.12 10-2

Localization	Moment	Constraint (MPa)	Aster
Not C	13000.	σ_{zz}	-14.06

8 Modeling F

8.1 Characteristics of modeling



Cutting: 1 in height, in width and thickness.
Modeling: `3D_HM`

8.2 Characteristics of the grid

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

8.3 Sizes tested and results

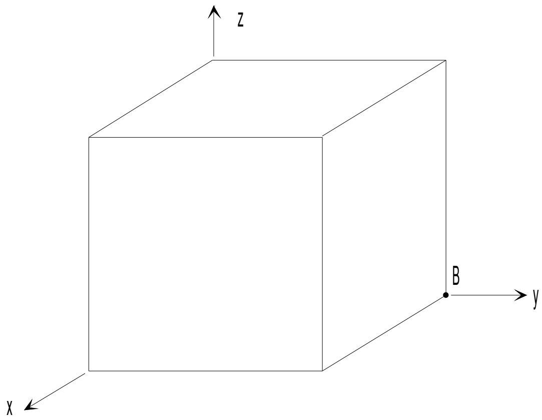
The values are tested in not-regression with a precision given of $0{,}1\%$

Localization	Moment	Déplacement (m)	Aster
Not C	13000.	DX	3.13 10-2

Localization	Moment	Constraint (MPa)	Aster
Not C	13000.	σ_{zz}	-14.04

9 Modeling G

9.1 Characteristics of modeling



Cutting: 1 in height, in width and thickness.
Modeling: `3D_HM`

9.2 Characteristics of the grid

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

9.3 Sizes tested and results

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

Localization	Moment	Déplacement (m)	Aster
Not C	13000.	DX	3.13 10-2

Localization	Moment	Constraint (MPa)	Aster
Not C	13000.	σ_{zz}	-14.04

10 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.