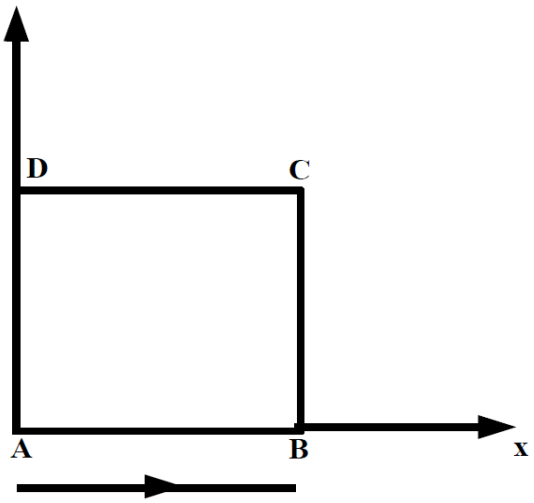
SSND104 - Validation of behavior DRUCK_PRAG_N_A

Summarized:

This test A relates to the case of a mesh alone for the two modelizations and B. In each one of them, two moduli STAT_NON_LINE are present to compare the Drucker-Prager behaviors in the associated and non-aligned version. In the modelization A, the idea is to choose a sufficiently large parameter P_ULTM so that the two models are comparable to perfect plasticity. Consequently, a cross validation of these two behaviors is undertaken. In the modelization B, materials parameters are more ordinary and the goal is to have a validation in NON-REGRESSION.

1 Problem of reference

1.1 Geometry



Appears 1.1-the

geometry refers to only one isoparametric finite element of form square, the length of each edge is worth 1.

1.2 Properties of the material

the solid mass consists of an elastoplastic material with linear isotropic hardening:

- Isotropic elasticity Young Modulus: $E=10^9\,Pa$
- Poisson's ratio: $\nu=0,3$
- Real constant density: $\rho=2764$
- Isotropic thermal coefficient of thermal expansion: $\alpha=0$

The characteristics of hardening are then given by:

- Coefficient of dependence in pressure: $\alpha=0,328$
- Elastic limit: $\sigma_y=2.11\times10^6$
- Ultimate stress: $\sigma_{yULT}=10^6$

For ultimate modelization
a: cumulated Plastic strain: $P_{ULT}=2$
For modelization b:
ultimate cumulated Plastic strain: $P_{ULT}=1.225\times10^{-2}$

1.3 Boundary conditions and loadings

One imposes a unit displacement according to the axis y on the segment CD, no one according to the axis y on the segment AB and no one according to the axis x on the segment AD.

In this case of test, concerning the modelization A, we simulate a case of perfect plasticity with the two Drucker-Prager constitutive laws in associated and non-aligned condition to check the data-processing coherence of the results. For that, it is enough to take large values for P_{ULT}.

2 Modelization A

2.1 Characteristic of the modelization

The modelization is two-dimensional with plane strains D_PLAN and nonlinear static.

2.2 Characteristics of the mesh

Number of noeuds4
Many SEG24
Many QUAD41
Number of group of mailles2

2.3 Quantities tested and results

the node $N4$ is located at the point C of the geometry.

DRUCK_PRAGER

Value tested	Urgent	Standard	Node	Reference	FORCED
Accuracy SIYY	1,75	N4	"NON_REGRESSION"	-5,5073.E+6	1.E-3
FORCED SIYY	2,5	N4	"NON_REGRESSION"	-6,4187.E+6	1.E-3
FORCED SIYY	3	N4	"NON_REGRESSION"	-6,4143.E+6	1.E-3
Local variable V1	1,75	N4	"NON_REGRESSION"	2,1703E-03	1.E-3
Local variable V1	2,5	N4	"NON_REGRESSION"	1,5577.E-2	1.E-3
Local variable V1	3	N4	"NON_REGRESSION"	2,7490.E-2	1.E-3
Displacement DY	1,07	N4	"ANALYTIQUE"	-5,5999.E-4	1.E-3
Displacement DY	1,16	N4	"ANALYTIQUE"	-1,2800.E-3	1.E-3
Displacement DY	1,34	N4	"ANALYTIQUE"	-2,7199.E-3	1.E-3
Displacement DY	1,53	N4	"ANALYTIQUE"	-4,2399.E-3	1.E-3

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3 Modelization B

3.1 Characteristic of the modelization

Identical to modelization A.

3.2 Caractéristiques of the mesh

Number of noeuds4
Many SEG24
Many QUAD41
Number of group of mailles2

3.3 Quantities tested and results

the node $N4$ are located at the point C of the geometry.

DRUCK_PRAGER

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Accuracy SIYY	1,07	N4	"NON_REGRESSION"	-6,1538.E+5	1.E-3
FORCED SIYY	1,16	N4	"NON_REGRESSION"	-1,4066.E+6	1.E-3
FORCED SIYY	1,34	N4	"NON_REGRESSION"	-2,9890.E+6	1.E-3
FORCED SIYY	1,53	N4	"NON_REGRESSION"	-4,6058.E+6	1.E-3
Local variable V1	1,07	N4	"NON_REGRESSION"	0.E+0	1.E-3
Local variable V1	1,16	N4	"NON_REGRESSION"	0.E+0	1.E-3
Local variable V1	1,34	N4	"NON_REGRESSION"	0.E+0	1.E-3
Local variable V1	1,53	N4	"NON_REGRESSION"	1,0487.E-04	1.E-3
Displacement DY	1,07	N4	"ANALYTIQUE"	-5,5999.E-4	1.E-3
Displacement DY	1,16	N4	"ANALYTIQUE"	-1,2800.E-3	1.E-3
Displacement DY	1,34	N4	"ANALYTIQUE"	-2,7199.E-3	1.E-3
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4 Summary of the results

This test makes it possible to have a validation crossed between two modelizations, the idea was to fix in the modelization A, a sufficiently large parameter P_ULTM so that the two models are comparable to perfect plasticity, on the other hand in the modelization B, materials parameters are more in coherence with typical data of the soils. In this case, the validation is in NON-REGRESSION. This example of non regression made it possible to test the influence of parameter P_ULTM between the two modelizations.