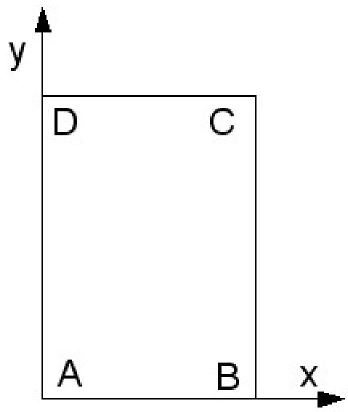
SSNP125 - CAS-test for the validation of the option INDL_ELGA

Summary:

This test aims to validate the indicator of localization INDL_ELGA by comparing the behaviors DRUCK-PRAGER in its associated version (see Doc. R7.01.16). Modeling is of type D_PLAN and takes into account a material with a damage on the level of one only mesh which results in a loss of cohesion of 5% in this same mesh in question. One benefits from this test for also validating elementary calculation PDIL_ELGA useful for the lenitive models associated with the mediums of second gradient of dilation.

1 Problem of reference

1.1 Geometry



Coordinates of the points	X	Y
A	0	0
B	0.5	0
C	0.5	1.0
D	0	1.0

The geometry is of form rectangular.

1.2 Properties of material

For modeling A, the farmhouseyew consists of an elastoplastic material with linear negative work hardening.

For modeling B, it solid mass consists of an elastoplastic material with parabolic negative work hardening.

The elastic parameters of material are the following:

- Young modulus: $E=5800\ MPa$
- Poisson's ratio: $\nu=0,3$
- Real constant density: $\rho=2764$
- Isotropic thermal dilation coefficient: $\alpha=0$

The characteristics of work hardening are then given by:

- Coefficient of dependence in pressure: $\alpha=0,33$
- Ultimate cumulated plastic deformation: $P_{ULT}=0,01$
- Elastic limit: $\sigma_y=2.11\,10^6$
- Elastic limit for the mesh concerned: $\sigma_y=2.\times10^6$

For modeling a:

- Module of work hardening for the whole of the grid: $H=-200.\times10^6$

For modeling b:

- Ultimate constraint: $\sigma_{yULT}=0.47\times10^6$

- Ultimate constraint for the mesh concerned : $\sigma_{yULT} = 0.44 \times 10^6$

1.3 Boundary conditions and loadings

One models a drained biaxial test (D_PLAN). Normal displacements with the study plan are thus worthless. One imposes a vertical displacement on $[DC]$ while keeping the side pressure constant ($2\,MPa$) in the study plan. The boundary conditions are thus the following ones:

$u_y = 0$ on $[AB]$ (group of mesh BAS)
$u_x = 0$ on $[AD]$ (group of mesh $GAUCHE$)
$\sigma_n = 2. \times 10^6$ on $[BC]$ (group of mesh $EXTREM$)

A vertical displacement is then imposed on $[DC]$ (group of mesh $HAUT$) to apply a vertical deformation until 3% .

1.4 Results

The solutions post-are treated of kind to control the evolution of the sizes of INDL_ELGA and of PDIL_ELGA in nonregression.

2 Modeling A

2.1 Characteristics of modeling

Modeling is two-dimensional with plane deformations D_PLAN with one Drucker-Prager behavior associated with a linear negative work hardening.

2.2 Characteristics of the grid

Many nodes: 661
Number of SEG3: 60
Number of QUAD8: 200
Number of group of meshs: 5

2.3 Sizes tested and results

Points of Gauss	Component of the field INDL_ELGA	Reference	Precision
1	INDEX	1.0	1E-3
1	DIR1	-32.0279	1E-3
2	INDEX	1.0	1E-3
2	DIR2	30.8960	1E-3
3	INDEX	1.0	1E-3
3	DIR3	-26.8726	1E-3
4	INDEX	1.0	1E-3
4	DIR4	-24.8401	1E-3
5	INDEX	1.0	1E-3
6	INDEX	1.0	1E-3
7	INDEX	1.0	1E-3
8	INDEX	1.0	1E-3
9	INDEX	1.0	1E-3
1	INDEX	1.0	1E-3
1	DIR1	31.4075	1E-3
1	INDEX	1.0	1E-3
1	DIR1	-32.6792	1E-3
2	INDEX	1.0	1E-3
2	DIR2	32.2241	1E-3
3	INDEX	1.0	1E-3
3	DIR3	21.9077	1E-3
4	INDEX	1.0	1E-3
4	DIR4	-17.7869	1E-3
5	INDEX	1.0	1E-3
6	INDEX	1.0	1E-3
7	INDEX	1.0	1E-3
8	INDEX	1.0	1E-3
9	INDEX	1.0	1E-3
1	INDEX	1.0	1E-3
1	DIR1	33.4990	1E-3

Points of Gauss	Component of the field PDIL_ELGA	Reference	Precision
1	A1_LC2	7.67142E+05	1E-3

3 Modeling B

3.1 Characteristics of modeling

Modeling is two-dimensional with plane deformations D_PLAN with one Drucker-Prager behavior associated with a parabolic negative work hardening.

3.2 Characteristics of the grid

Many nodes: 661
Number of SEG3: 60
Number of QUAD8: 200
Number of group of meshs: 5

3.3 Sizes tested and results

Points of Gauss	Component of field INDL_ELGA	Reference	Precision
1	INDEX	1.0	1E-3
2	INDEX	1.0	1E-3
3	INDEX	1.0	1E-3
4	INDEX	1.0	1E-3
5	INDEX	1.0	1E-3
6	INDEX	1.0	1E-3
7	INDEX	1.0	1E-3
8	INDEX	1.0	1E-3
9	INDEX	1.0	1E-3
1	INDEX	1.0	1E-3
NAP	INDEX	284.9488	1E-3
1	INDEX	1.0	1E-3
2	INDEX	1.0	1E-3
3	INDEX	1.0	1E-3
4	INDEX	1.0	1E-3
5	INDEX	1.0	1E-3
6	INDEX	1.0	1E-3
7	INDEX	1.0	1E-3
8	INDEX	1.0	1E-3
9	INDEX	1.0	1E-3
1	INDEX	1.0	1E-3
NAP	INDEX	332.2233	1E-3

The table gathers the values which correspond to the sums on the whole of the grid of the components of the indicator of localization INDL_ELGA. We thus have a slow evolution of the indicator which hardly evolves with each realization of this test.

4 Summary of the results

One traces in this CAS-test the values obtained with the criterion `INDL_ELGA` on an example of triaxial compression test in compression describes by a softening behavior of Drucker-Prager type. They are values in nonregression. A calculation of the option is also added `PDIL_ELGA` for the Drucker-Prager model. The values obtained are also tested in non_regression.