
SSNP506 – Checking of offsetting into nonlinear

Summary:

This CAS-test validates the functionality of the offsetting of the plates `DKT` into nonlinear. A plate is considered perforated with an elastic behaviour with nonlinear isotropic work hardening of type `VMIS_ISOT_TRAC` into quasi-static.

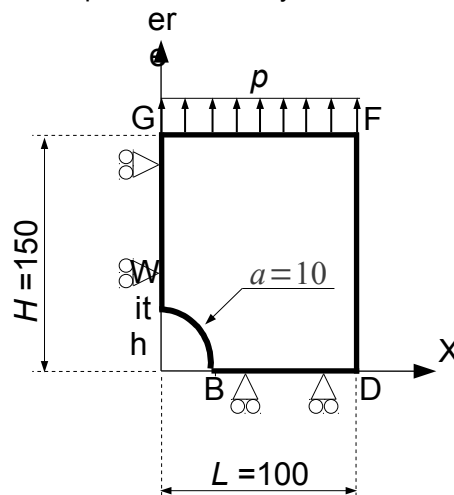
Modeling a: `DKT + STAT_NON_LINE/VMIS_ISOT_TRAC`

Modeling b: `DKQ + STAT_NON_LINE/ VMIS_ISOT_TRAC`

1 Problem of reference

1.1 Geometry

It is about a rectangular plate thickness 1mm, comprising a hole and modelled with DKT DKT. One models only one quarter of the plate thanks to symmetries. Dimensions are given in millimetres.



1.2 Boundary conditions and loadings

Conditions of symmetry

The plate is blocked according to O_x along the side AG : $DY=0.0, DZ=0.0, DRY=0.0$.
It is blocked according to O_y along the side BD : $.$

Loading in imposed constraint

It is subjected to a traction $p(t)$ according to O_y distributed on the side FG .
 $p(t=0)=0$, $p(t=1000)=1000$.

One stops with the whole beginning of plasticity at the edge of the hole i.e. with 110s.

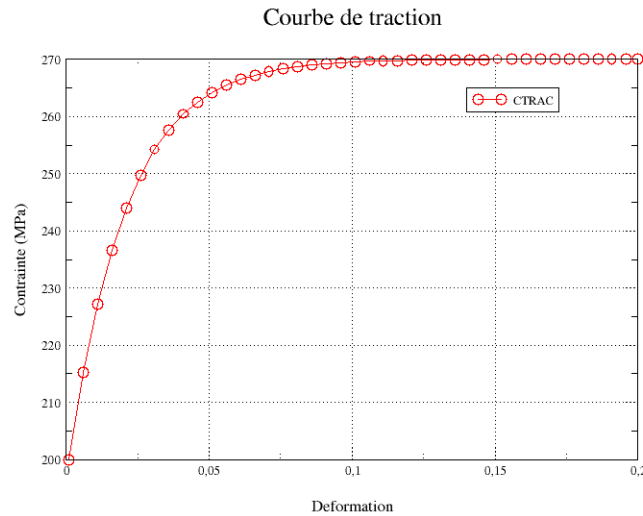
1.3 Properties of materials

The behavior is elastoplastic of Von Mises, with isotropic work hardening.

Elastic characteristics are:

- Young modulus $E=200\,000\text{ MPa}$;
- Poisson's ratio $\nu=0.3$;
- Elastic limit: 200 MPa ;

Work hardening is deduced from the traction diagram defined by the following data (prolongation constant right `PROL_DROITE=' CONSTANT '`):



Epsilon	Sigma (Mpa)		Epsilon	Sigma (Mpa)
1.00000E-03	2.00000E+02		1.06000E-01	2.69626E+02
6.00000E-03	2.15275E+02		1.11000E-01	2.69709E+02
1.10000E-02	2.27253E+02		1.16000E-01	2.69773E+02
1.60000E-02	2.36630E+02		1.21000E-01	2.69823E+02
2.10000E-02	2.43964E+02		1.26000E-01	2.69862E+02
2.60000E-02	2.49694E+02		1.31000E-01	2.69893E+02
3.10000E-02	2.54168E+02		1.36000E-01	2.69917E+02
3.60000E-02	2.57659E+02		1.41000E-01	2.69935E+02
4.10000E-02	2.60382E+02		1.46000E-01	2.69949E+02
4.60000E-02	2.62506E+02		1.51000E-01	2.69961E+02
5.10000E-02	2.64161E+02		1.56000E-01	2.69969E+02
5.60000E-02	2.65451E+02		1.61000E-01	2.69976E+02
6.10000E-02	2.66457E+02		1.66000E-01	2.69981E+02
6.60000E-02	2.67240E+02		1.71000E-01	2.69986E+02
7.10000E-02	2.67850E+02		1.76000E-01	2.69989E+02
7.60000E-02	2.68325E+02		1.81000E-01	2.69991E+02
8.10000E-02	2.68696E+02		1.86000E-01	2.69993E+02
8.60000E-02	2.68984E+02		1.91000E-01	2.69994E+02
9.10000E-02	2.69209E+02		1.96000E-01	2.69996E+02
9.60000E-02	2.69384E+02		2.00000E-01	2.69996E+02
1.01000E-01	2.69520E+02			

Table 1.3-1

2 Reference solution

2.1 Method of calculating

To validate offsetting into non-linear, one compares the solution (in constraints and displacements) of a plate alone with two stuck dislocate-thickness and offset plates of the quarter this thickness.

2.2 Remarks

Because of the theoretical assumptions of calculation of shear stresses on DKT, one cannot to compare a homogeneous plate with its equivalent of two plates stuck in the thickness. Therefore, component SIXZ of the constraint is not tested in this case.

3 Modeling A

3.1 Characteristics of modeling

A modeling is used DKT.

3.2 Characteristics of the grid

The grid contains 42 meshes of the type TRIA3, 22 meshes of SEG2 and 22 nodes.

3.3 Sizes tested and results

Identification	Type of reference	Value of reference	Precision
RESUPOS1 B - SIYY	'AUTRE_ASTER'	28.9927	1 %

Table 3.3-1

4 Modeling B

4.1 Characteristics of modeling

A modeling is used DKQ.

4.2 Characteristics of the grid

The grid contains meshes of the type 420 QUAD4, 60 meshes of SEG2 and 391 nodes.

4.3 Sizes tested and results

Identification	Type of reference	Value of reference	Precision
RESUPOS1 B - SIYY	'AUTRE_ASTER'	28.3820	1 %

Table 4.3-1

5 Summary of the results

The results are in perfect agreement some is the type of grid with the reference solution which is the homogeneous plate.