

SSNA303: Test-tube notched elastoplastic in great deformations

Summary:

This test models a notched sample in axi-symmetry. The behavior is elastoplastic with linear isotropic work hardening of type von Mises (VMIS_ISOT_LINE).

ON does a calculation of the type SIMO_MIEHE, very-rubber band qu l' one compared to GDEF_LOG, hypo-rubber band.

The compared data are the effort resulting and the contraction from the ligament.

1 Problem of reference

1.1 Geometry

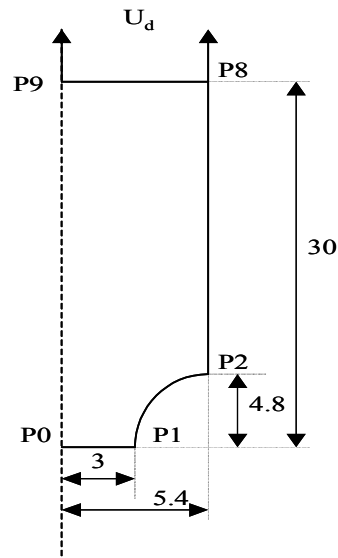


Figure1: Problem of reference

The test-tube is axisymmetric, and only half of the test-tube is modelled by elements. Dimensions are given here in millimetres.

1.2 Data of material

The material considered is elastoplastic with linear isotropic work hardening of type von Mises (VMIS_ISOT_LINE).

The data material used are the following ones:

Young modulus:	200 000 MPa
Poisson's ratio	0,3
Elastic limit	200 MPa
Linear module of work hardening	20 000 MPa

1.3 Boundary conditions and loadings

Because of symmetry, vertical displacements are blocked on the line $P0-P1$ and horizontal displacements are blocked on the axis $P0-P9$; the loading consists of a vertical displacement imposed on the side $P8-P9$:

axis $P0-P9$	$DX = 0$
axis $P0-P1$	$DY = 0$
axis $P8-P9$	$DY = 6 \text{ mm}$

The loading is imposed in 50 increments of 0.12 mm .

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2 Results of reference

The results of reference are of not-regression. One compares the contraction of the ligament, i.e. following displacement x node $P1$, as well as the resulting effort (REAC_NODA) on the face $P8 - P9$.

Values of imposed displacement $Ud=0,6\text{ mm}$, $Ud=3\text{ mm}$ and $Ud=6\text{ mm}$ are considered.

The final deformations obtained are to the maximum of 70%.

3 Modeling A

3.1 Characteristic of modeling

Modeling tests GDEF_LOG in AXIS

3.2 Characteristics of the grid

The grid is carried out under GIBI. It is represented on Figure 2. It contains 1440 nodes for 445 quadratic quadrangular elements (QUAD8).

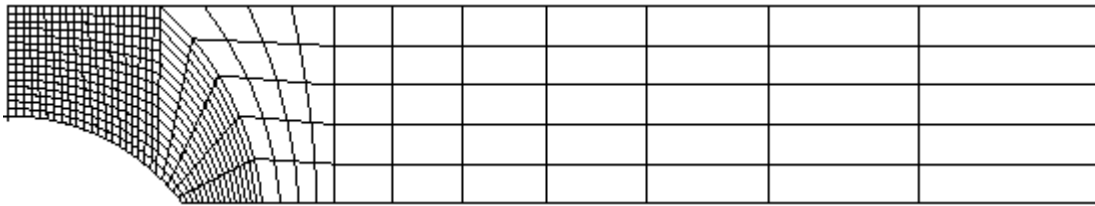


Figure 2: Grid GIBI used

3.3 Sizes tested and results

For the deformation of SIMO_MIEHE :

Imposed displacement	Sizes tested	Reference (AUTRE_ASTER)	Tolerance
$U = 0,6 \text{ mm}$	REAC_NODA on P8P9	6616,59 N	5.0E-3
	U_x in P1	-0,0845 mm	5.0E-3
$U = 3 \text{ mm}$	REAC_NODA on P8P9	21541 N	5.0E-3
	U_x in P1	-0,3766 mm	5.0E-3
$U = 6 \text{ mm}$	REAC_NODA on P8P9	33821 N	5.0E-3
	U_x in P1	-0,826 mm	5.0E-3

For the deformation of GDEF_LOG , in comparison with SIMO_MIEHE :

Imposed displacement	Sizes tested	Reference (AUTRE_ASTER)	Tolerance
$U = 0,6 \text{ mm}$	REAC_NODA on P8P9	6616,59 N	1 %
	U_x in P1	-0,0845 mm	1 %
$U = 3 \text{ mm}$	REAC_NODA on P8P9	21541 N	1 %
	U_x in P1	-0,3766 mm	1 %
$U = 6 \text{ mm}$	REAC_NODA on P8P9	33821 N	1 %
	U_x in P1	-0,826 mm	1 %

4 Summary of the results

The formulation `GDEF_LOG` conduit with a maximum difference of 1% , which is explained by the difference in measurement of deformation.