

SSLP102 - Rate of refund of energy with predeformations

Summarized

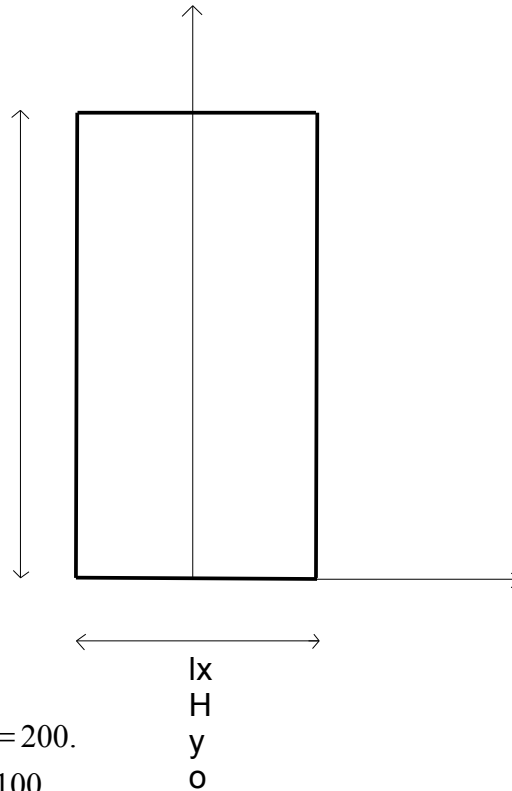
This test makes it possible to calculate rate of energy restitution G by the method theta for a static problem of mechanics in plane strains with in the presence of pre-déformations sur 4 different integration contours.

This test contains a modelization in plane strains.

1 Problem of reference

1.1 Geometry

It acts of a rectangular plate centered over its width compared to the axis $\vec{o}y$.



Height of the plate: $H = 200$.

Width of the plate: $l = 100$.

1.2 Material properties

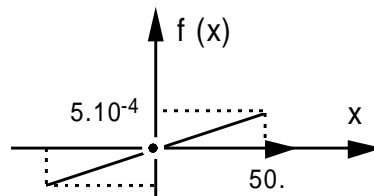
Modulus Young: $E = 2.10^4 \text{ MPa}$
Poisson's ratio: $\nu = 0.3$
Density: $\rho = 1.0 \text{ Kg/m}^3$
thermal Coefficient of expansion: $\alpha = 5.10^{-6} / ^\circ\text{C}$

We place ourselves on the assumption of the plane strains.

1.3 Boundary conditions and loadings

- Displacements for $y=0$ and $y=H$: $v=0$.
- Displacements for $x=l/2$: $u=0$.
- Predeformations: $\varepsilon_{xx} = \varepsilon_{yy} = \varepsilon_{zz} = f(x)$

The predeformations are such as:



2 Reference solution

It does not exist of reference solution. It is about a test of non regression.

3 Modelization A

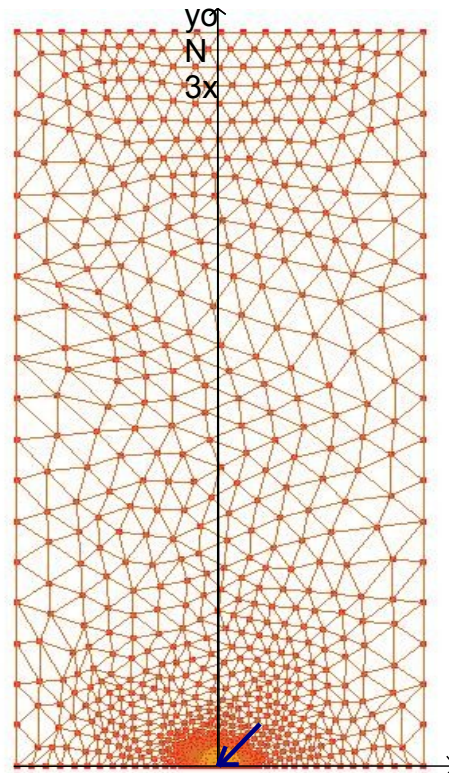
3.1 Characteristic of the modelization

Modelization: D_PLAN (plane strains)

3.2 Characteristic of the mesh

Many nodes: 853

Number of meshes and types: 359 TRIA6 and 27 QUAD8



3.3 Quantities tested and results

Identification	characteristics	G (Reference)	G (Aster)	% difference
Crowns 1: $R_{inf} = 1$, $R_{sup} = 5$	Predeformations	0.1800	0.1802	0.09 %
Contour 2: $R_{inf} = 5$, $R_{sup} = 10$	Predeformations	0.1800	0.1801	0.07 %
Contour 3: $R_{inf} = 10$, $R_{sup} = 20$	Predeformations	0.1800	0.1801	0.06 %
Contour 4: $R_{inf} = 20$, $R_{sup} = 30$	Predeformations	0.1800	0.1801	0.06 %
Contour 3: $R_{inf} = 10$, $R_{sup} = 20$	Predeformations + initial state (DEPL)	0.1210	0.12129	0.24 %
Contour 4: $R_{inf} = 20$, $R_{sup} = 30$	Predeformations + initial state (DEPL)	0.2880	0.28795	0.02 %

3.4 Remarks

It is necessary to multiply by two the rough results since a half-structure was represented (in a half - contour).

4 Summary of the results

the variation of the results of G on each contour with different data (predeformation or not) is of less 0.3% . It is noted that the invariance of G following contours is excellent for computation `Code_Aster`.