

## SSLP102 - Rate of refund of energy with predeformations

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### Summary

This test makes it possible to calculate the rate of refund of energy  $G$  by the method theta for a static problem of mechanics in plane deformations with in the presence of predeformations on 4 different crowns of integration.

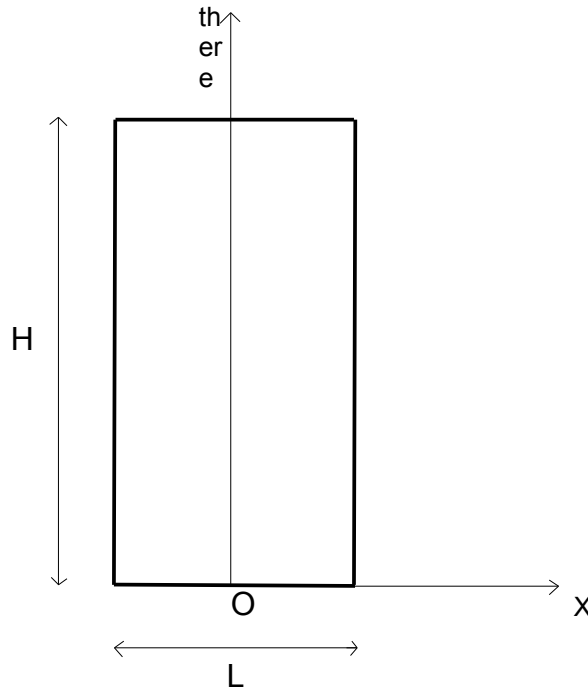
This test contains a modeling in plane deformations.

## 1 Problem of reference

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### 1.1 Geometry

It is about 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

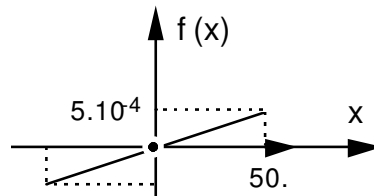
Young modulus:	$E = 2.10^4 \text{ MPa}$
Poisson's ratio:	$\nu = 0.3$
Density	$\rho = 1.0 \text{ Kg/m}^3$
Thermal dilation coefficient	$\alpha = 5.10^{-6} / ^\circ \text{C}$

We place ourselves on the assumption of the plane deformations.

### 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

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There does not exist reference solution. It is about a test of nonregression.

## 3 Modeling A

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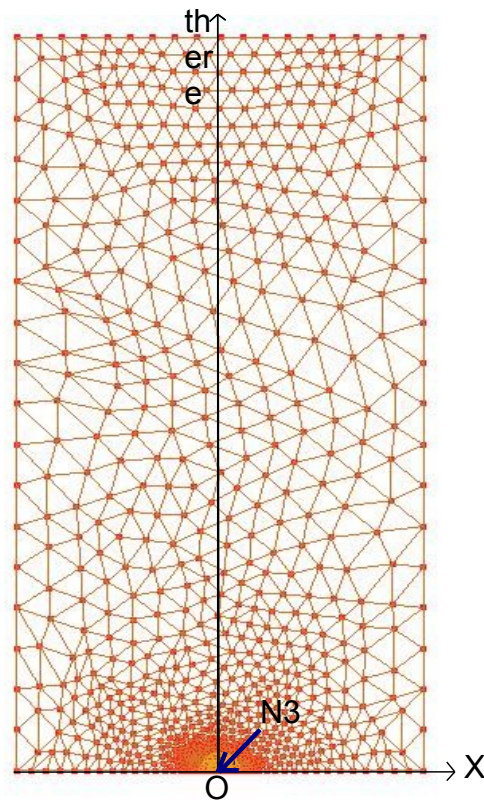
### 3.1 Characteristics of modeling

Modeling: D\_PLAN (plane deformations)

### 3.2 Characteristics of the grid

Many nodes: 853

Many meshes and types: 359 TRIA6 and 27 QUAD8



### 3.3 Sizes tested and results

Identification	characteristics	$G$ (Reference)	$G$ (Aster)	% difference
Crown 1: $R_{inf} = 1$ , $R_{sup} = 5$	Predeformations	0.1800	0.1802	0.09 %
Crown 2: $R_{inf} = 5$ , $R_{sup} = 10$	Predeformations	0.1800	0.1801	0.07 %
Crown 3: $R_{inf} = 10$ , $R_{sup} = 20$	Predeformations	0.1800	0.1801	0.06 %
Crown 4: $R_{inf} = 20$ , $R_{sup} = 30$	Predeformations	0.1800	0.1801	0.06 %
Crown 3: $R_{inf} = 10$ , $R_{sup} = 20$	Predeformations + initial state (DEPL)	0.1210	0.12129	0.24 %
Crown 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 gross profits since a half-structure was represented (in a half - crown).

## 4 Summary of the results

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The variation of the results of  $G$  on each crown with different data (predeformation or not) is of less 0.3% .  
It is noted that the invariance of  $G$  according to the crowns is excellent for calculation *Code\_Aster*.