

## SSLP300 – Rectangular plate cantilever in inflection-shearing in its plan

---

### Summary:

The objective of this CAS-test is to validate the inflection of a plate in a plan, under the effect of a shearing action. It is about a problem 2D in plane constraints.



## 2 Reference solution

---

### 2.1 Method of calculating used for the reference solution

The field of displacement following the axis  $y$  at the end of the plate (segment  $BC$ ) is given on the assumption of the theory of the beams by:

$$u_y^{BC} = \frac{PL^3}{3EI_z} \left(1 + 0.98 \frac{l^2}{L^2}\right)$$
 (solution with taking into account of the shearing action in a beam of Timoshenko)

from where  $u_y^{BC} = 0.00121 \text{ m}$

The normal stress field  $\sigma_{xx}$  had with the inflection is given by:

$$\sigma_{xx} = \frac{Pl}{2I_z} (L - x)$$
 on the edge  $AB$

that is to say  $\sigma_{xx} = 37.8 \times 10^6 (L - x)$

### 2.2 Results of reference

- Displacements  $u_y$  nodes  $B$  and  $C$
- Constraints  $\sigma_{xx}$  nodes  $A$ ,  $B$ ,  $E$

### 2.3 Uncertainty on the solution

Analytical solution.

### 2.4 Bibliographical references

S. Timoshenko. *Resistance of Materials, 1st part*. Polytechnic bookstore CH. Béranger, Paris, 1947, pp 163-168.



## 4 Summary of the results

---

The results are in very good agreement with the analytical solution.