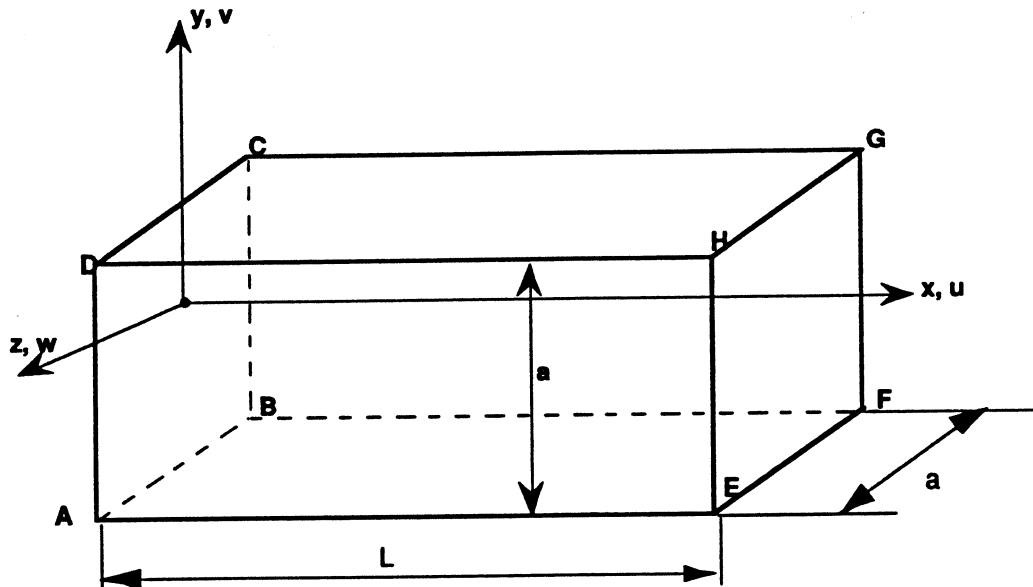

SSLV306 - Beam 3D in imposed displacements

Summarized:

The purpose of the test is validating the displacements imposed on sides (`FACE_IMPO`), their values being variable in space. These values are imposed at the end of a beam 3D, modelling a bending strain.

1 Problem of reference

1.1 Geometry



Length : $L = 2\text{ m}$
 Square section, on side : $a = 0.2\text{ m}$
 Main moment of inertia : $I = 1.333 \times 10^{-4}\text{ m}^4$

1.2 Material properties

$E = 2.1 \times 10^{11}\text{ Pa}$
 $\nu = 0.3$

1.3 Boundary conditions and loadings

Fixed support of the section $ABCD$

Displacement imposed on the face $EFGH$:

- constant v_o in the direction y , $v_o = 0.952 \times 10^{-5}\text{ m}$
- variable according to the position y of the point of the section, and being worth:
 $u_o = -y\theta_o$, $\theta_o = 0.714 \times 10^{-5}\text{ radians}$

1.4 Initial conditions

Without object for the static analysis.

2 Reference solution

2.1 Method of calculating used for the reference solution

the displacements imposed equivalent on an applied force at the end of resultant:

$$F = \frac{3EI}{L^3} v_o = 100N$$

θ_o represent the rotation of the section $EFGH$:

$$\theta_o = \frac{FL^2}{2EI}$$

The bending stress σ_{xx} to the fixed support is worth then:

$$\sigma_{xx}(ABCD) = \pm \frac{FL}{I/y}$$

2.2 Results of reference

- 1) Displacement v of the points E, F, G, H
- 2) Stress bending σ_{xx} to the points A, B, C, D

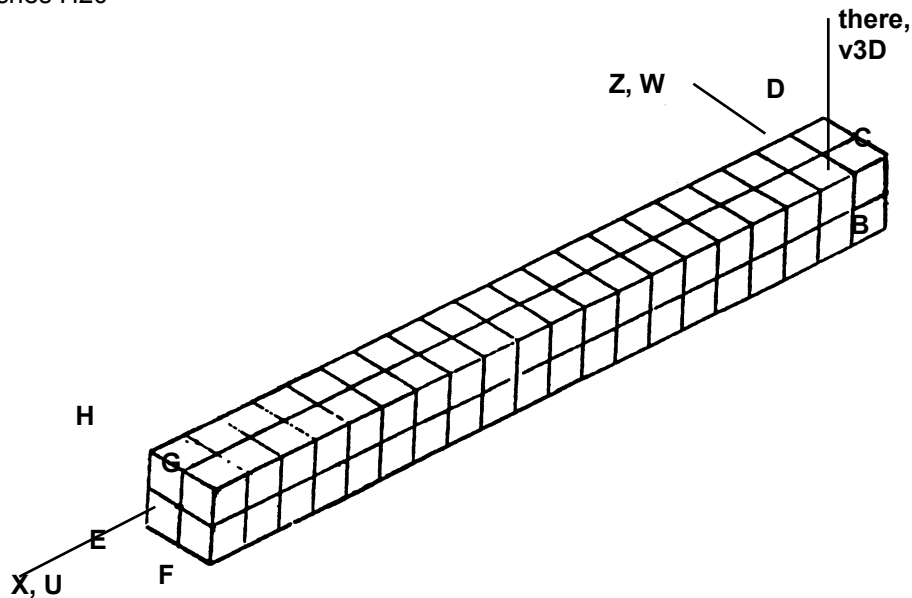
2.3 Uncertainty on the analytical

solution Solution.

3 Modelization A

3.1 Characteristic of the modelization

, meshes H20



Loading by displacements imposed on face *EFGH* :

$$DY : 0,952 \times 10^{-5}$$

DX : function of y defined in 2 points:

$$f(0)=0$$

$$f(0,1)=-0.0714E-5$$

Cutting:

- 1) 20 elements according to the length
- 2) 2 elements according to the width and the thickness

3.2 Characteristics of the mesh

Many nodes: 621

Number of meshes and types: 80 HEXA20

4 Results of the modelization A

4.1 Values tested

Standard	Localization of value	Reference	Aster	% difference
Items <i>E, F, G, H</i>	$v(m)$	9.52 X 10-6	9.52 X 10-6	0 points
<i>E, F</i>	$u(m)$	7.14 X 10-7	7.14 X 10-7	0.
Points <i>G, H</i>	$u(m)$	- 7.14 X 10-7	- 7.14 X 10-7	0.
Points <i>A, B</i>	$\sigma_{xx}(Pa)$	1.5 X 105	1.64 X 105.9.5	
Points <i>C, D</i>	$\sigma_{xx}(Pa)$	- 1.5 X 105	- 1.64 X 105	- 9.5

5 Summary of the results

the functionality "displacements imposed function" provides the expected results; the values of bending stresses are satisfactory, given that with the dealt problem is a problem of bending.