

## SSNV170 - Cubic in simple traction (speed of constant deformation)

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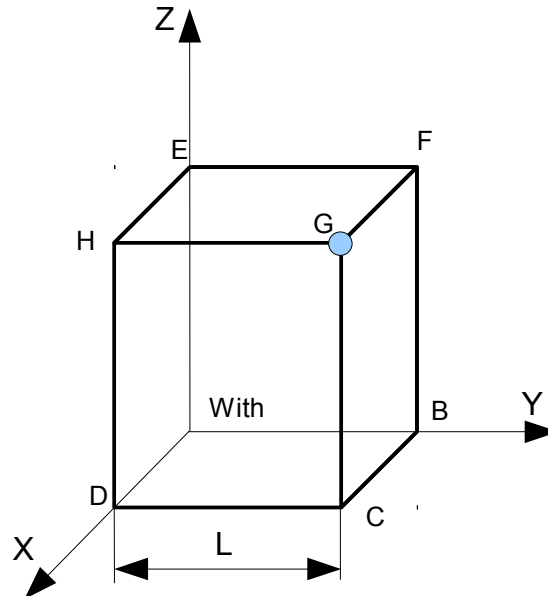
### Summary:

This case test makes it possible to implement an axial creep test. Both first modelings (non-linear) simulate a simple tensile test with a speed of constant imposed deformation. Modeling C is based on modeling B with materials and different loadings making it possible to activate the pseudo-discharge of `VISC_TAHERI`. In three modelings, traction is carried out on a cube modelled in 3D with a mesh `HEXA8`.

- Modeling A
  - Use of the relation of nonlinear behavior viscoplasticity of Lemaître.
- Modeling b:
  - Use of the relation of cyclic behavior of elastoplasticity of Taheri.
- Modeling C :
  - Use of the relation of cyclic behavior of elastoplasticity of Taheri with activation of the pseudo-discharge.

## 1 Problem of reference

### 1.1 Geometry



The cube is in space  $[0.,1.] \times [0.,1.] \times [0.,1.]$ .

Coordinates of the points ( $m$ ) :

$$A:(0.,0.,0.)$$

$$G:(1.,1.,1.)$$

Geometry of the cube

$$L=1$$

### 1.2 Properties of material

- Rubber band
  - $E=200.0 \times 10^3 Pa$  Young modulus
  - $\nu=0.3$  Poisson's ratio
- Lemaitre
  - $n=10.8$  ;  $\frac{1}{K}=6.9 \times 10^{-4}$  ;  $\frac{1}{m}=0.102$
- Taheri (modelings A and B)
  - $R_0=0.001$
  - $\alpha=0.$
  - $m=1.$
  - $A=0.$
  - $b=0.$
  - $C_1=0.$
  - $C_\infty=0.$

- $S=900$ .
- Taheri (modeling C)
  - $R_0=72$ .
  - $\alpha=0.3$
  - $m=0.1$
  - $A=312$ .
  - $b=30$ .
  - $C_1=0$ .
  - $C_\infty=0.065$
  - $S=450$ .

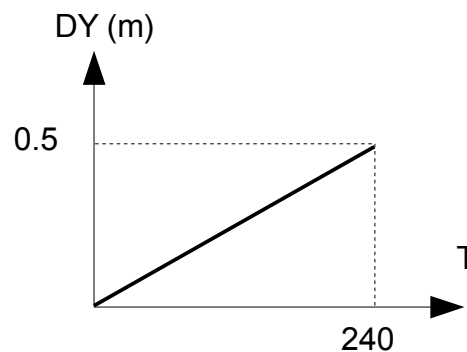
## 1.3 Boundary conditions and loadings

### 1.3.1 Modelings A and B

Imposed displacement ( $m$ ) :

- face  $ABCD$  :  $DZ=0$
- face  $AEHD$  :  $DY=0$
- face  $BFGC$  :  $DY=0.5$
- face  $ABFE$  :  $DX=0$

Displacement  $DY$  imposed on the face  $BFGC$ , varies gradually according to the function presented on the figure below.



### 1.3.2 Modeling C

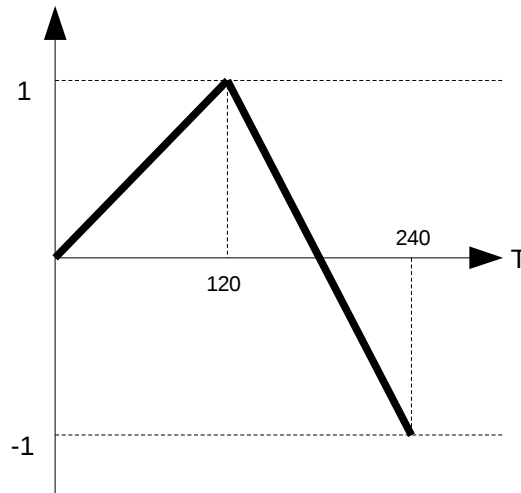
Imposed displacement ( $m$ ) :

- face  $ABCD$  :  $DZ=0$
- face  $AEHD$  :  $DY=0$
- face  $ABFE$  :  $DX=0$

Pressure imposed ( $Pa$ ) :

- face  $BFGC$  :  $PRES=-520$

The multiplying function of the pressure imposed E on the face *BFGC* according to time is Re presented on the figure below.



## 2 Reference solution

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

The reference was obtained by comparison of the solutions between modelings With and B. For modeling C, it is only about not-regression.

### 2.2 Reference variable

- Constraint  $SIYY$  at the point  $G$

### 2.3 Result of reference

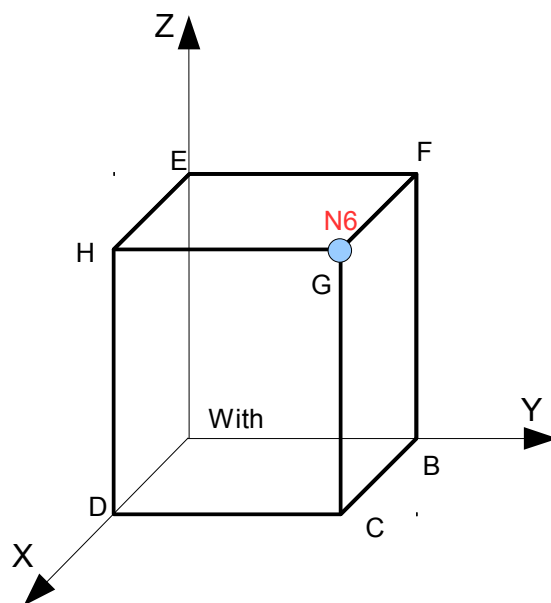
Modeling A and b:

| Size        | moment | Not | Reference |
|-------------|--------|-----|-----------|
| $SIYY (Pa)$ | 40     | $G$ | 632.29325 |
|             | 240    | $G$ | 761.7493  |

## 3 Modeling A

### 3.1 Characteristics of modeling A

Modeling 3D,  
Relation of behavior of LEMAITRE



|             |   |                 |
|-------------|---|-----------------|
| Many nodes  | 8 |                 |
| Many meshes | 6 | That is to say: |
|             |   | QUAD4 5         |
|             |   | HEXA8 1         |

Groups of Meshs

- *DEVANT* face *ABCD*
- *BAS* face *AEHD*
- *HAUT* face *BFGC*
- *GAUCHE* face *ABFE*

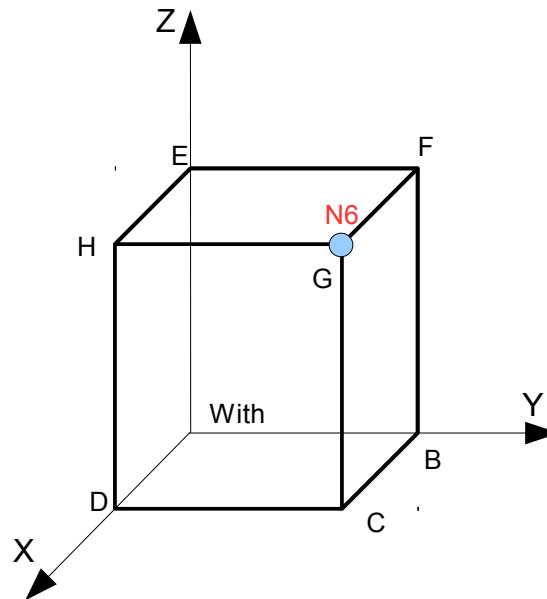
### 3.2 Sizes tested and results

| Size             | moment | Node      | Reference | Aster     | Variation (%) |
|------------------|--------|-----------|-----------|-----------|---------------|
| <i>SIYY (Pa)</i> | 40     | <i>N6</i> | 632.29325 | 632.29325 | 9.19E-8       |
|                  | 240    | <i>N6</i> | 761.7493  | 761.7493  | -2.54E-7      |

## 4 Modeling B

### 4.1 Characteristics of modeling B

Modeling 3D,  
Relation of behavior of VISC\_TAHERI



|             |   |                 |
|-------------|---|-----------------|
| Many nodes  | 8 |                 |
| Many meshes | 6 | That is to say: |
|             |   | QUAD4 5         |
|             |   | HEXA8 1         |

Groups of Meshs

- *DEVANT* face *ABCD*
- *BAS* face *AEHD*
- *HAUT* face *BFGC*
- *GAUCHE* face *ABFE*

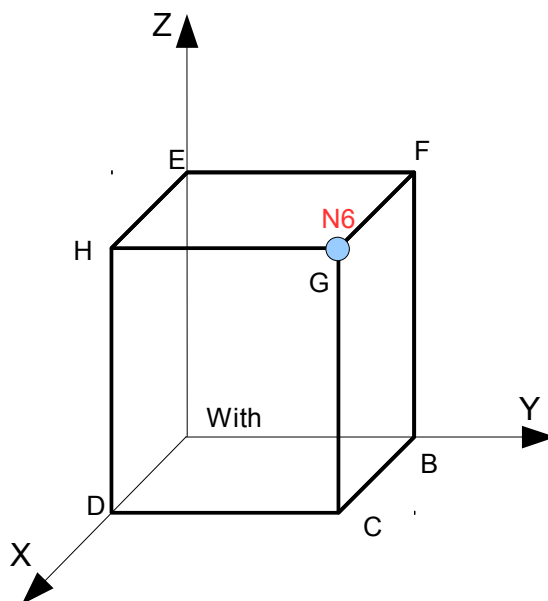
### 4.2 Sizes tested and results

| Size             | moment | Node      | Reference | Aster     | Variation (%) |
|------------------|--------|-----------|-----------|-----------|---------------|
| <i>SIYY (Pa)</i> | 40     | <i>N6</i> | 632.29325 | 632.29325 | 9.19E-8       |
|                  | 240    | <i>N6</i> | 761.7493  | 761.7493  | -2.60E-7      |

## 5 Modeling C

### 5.1 Characteristics of modeling C

Modeling 3D,  
Relation of behavior of VISC\_TAHERI



|             |   |                 |
|-------------|---|-----------------|
| Many nodes  | 8 |                 |
| Many meshes | 6 | That is to say: |
|             |   | QUAD4      5    |
|             |   | HEXA8     1     |

Groups of Meshes

- *DEVANT* face *ABCD*
- *BAS* face *AEHD*
- *HAUT* face *BFGC*
- *GAUCHE* face *ABFE*

### 5.2 Sizes tested and results

| Size             | moment | Node      | Reference | Aster         | Variation (%) |
|------------------|--------|-----------|-----------|---------------|---------------|
| <i>SIYY (Pa)</i> | 40     | <i>N6</i> | -         | 173.333155641 | -             |
|                  | 168    | <i>N6</i> | -         | 104.0         | -             |



## 6 Summary of the results

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The comparison between the results got by this CAS-test and those of references is very satisfactory.