# ZZZZ223 - Validation of CREA_RESU/ASSE and Summarized

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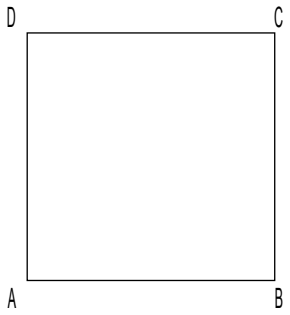
This test shows how to do a thermomechanical computation whose thermal loading is complex, i.e. comprising several transients, repeated several times.

# 1 Problem of reference

## 1.1 Geometry




Coordinated of the points $(m)$ :

$A:(0.,0.)$
$B:(1.,0.)$
$C:(1.,1.)$
$D:(0.,1.)$

## 1.2 Properties of the Thermal

- Mechanical

$E=1.N/m^2$
$\nu=0.$
$\alpha=1.°C^{-1}$

- material

$\lambda=1.w/m/°C$
$\rho cp=1.J/m^3°C$

## 1.3 Boundary conditions and loadings

- imposed Displacements:
  - $A$ : $DX=DY=0.$
  - $B$ : $DY=0.$
- Imposed thermal loading:

One defines two homogeneous thermal evolutions in space:

$ch1$ in temperature of 10 degrees to 17 degrees is a descent $[0.,0.7\,s]$
$ch2$ in temperature of 17 degrees to 14 degrees the cycle is $[0.,0.3\,s]$

a rise $[ch1+ch2]$ is shifted to form the interval $[1.5,2.5\ s]$. This cycle is repeated periodically and mechanical computation is calculated on the interval $[0.5,4.5s]$.

# 2 Quantities and

## 2.1 result reference solution of reference

It acts of a free problem of thermal expansion $(\alpha=1)$ of a square $(1\times1)$.

Displacement according to $Y$ point $C$ is then identical to the imposed temperature.

One can thus check that the curve of displacement is well a succession of cycles of rise-descent between temperatures 10 and 17.

One tests:

- With point: $C$ $DY(t=1.0\text{s})=DY(t=2.0\text{s})=DY(t=4.0\text{s})=15.\text{m}$
- With point: $C$ $DY(t=1.3\text{s})=DY(t=2.3\text{s})=DY(t=4.3\text{s})=16.\text{m}$

# 3 Modelization A

## 3.1 Characteristic of the modelization A

Modelization PLANE, D_PLAN :

| | | | |
|---|---|---|---|
| Many nodes | 4 | | |
| Number of meshes | 1 | Are: | 1 QUAD4 |

## 3.2 Results

| Not | Quantity | Time $(sec)$ | Reference $(m)$ | Tolerance (%) |
|---|---|---|---|---|
| $C$ | $DY$ | $t=1$ | 15 | 0.100 |
| | $DY$ | $t=2$ | 15 | 0.100 |
| | $DY$ | $t=4$ | 15 | 0.100 |
| | $DY$ | $t=1$ | 16 | 0.100 |
| | $DY$ | $t=2$ | 16 | 0.100 |
| | $DY$ | $t=4$ | 16 | 0.100 |

# 4 Summary of the results

the results thermomechanical got in displacement with modelization D_PLAN show the good taking into account of a complex thermal loading.