

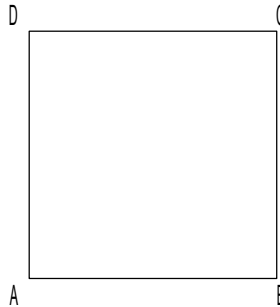
ZZZZ223 - Validation of CREA_RESU/ASSE and AFFE_MATERIAU/AFFE_VARC/FONC_INST

Summary:

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

1 Problem of reference

1.1 Geometry



Coordinates of the points (m) :

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

$$B : (1., 0.)$$

$$C : (1., 1.)$$

$$D : (0., 1.)$$

1.2 Properties of material

- Mechanics

$$E = 1. N/m^2$$

$$\nu = 0.$$

$$\alpha = 1. ^\circ C^{-1}$$

- Thermics

$$\lambda = 1. w/m/^\circ C$$

$$\rho cp = 1. J/m^3/^\circ C$$

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:

$ch1$ is a rise in temperature of 10 degrees to 17 degrees $[0., 0.7 s]$

$ch2$ is a descent in temperature of 17 degrees to 14 degrees $[0., 0.3 s]$

The cycle $[ch1 + ch2]$ is shifted to form the interval $[1.5, 2.5 s]$. This cycle is repeated periodically and the mechanical calculation is done on the interval $[0.5, 4.5 s]$.

2 Reference solution

2.1 Sizes and results of reference

It is about a free problem of dilation ($\alpha=1$) of a square (1×1).

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:

- At the point C : $DY(t=1.0s)=DY(t=2.0s)=DY(t=4.0s)=15.m$
- At the point C : $DY(t=1.3s)=DY(t=2.3s)=DY(t=4.3s)=16.m$

3 Modeling A

3.1 Characteristics of modeling A

Modeling PLAN, D_PLAN :

Many nodes	4		
Many meshes	1	That is to say:	1 QUAD4

3.2 Results

Not	Size	Moment (<i>sec</i>)	Reference (<i>m</i>)	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

Results thermomechanical got in displacement with modeling `D_PLAN` show the good catch in account of a complex thermal loading.