

TTNP01 – Problem of STEFAN with lumped elements - Summarized

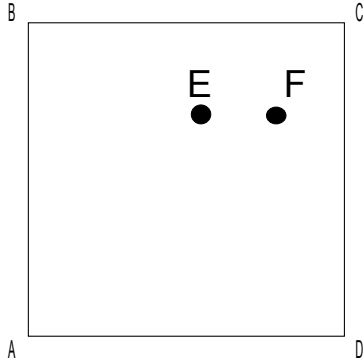
QUAD9:

This case test validates modelization `PLAN_DIAG` in nonlinear thermal in the case of a thermal shock.

The got results are compared with an analytical solution.

1 Problem of reference

1.1 Geometry



the square is in space $[0., 4.] \times [0., 4.]$.

Coordinates of the points (m) :

$A : (0., 0.)$

$B : (0., 4.)$

$C : (4., 4.)$

$D : (4., 0.)$

$E : (2., 3.)$

$F : (3., 3.)$

Group mail:

LAB : segment AB

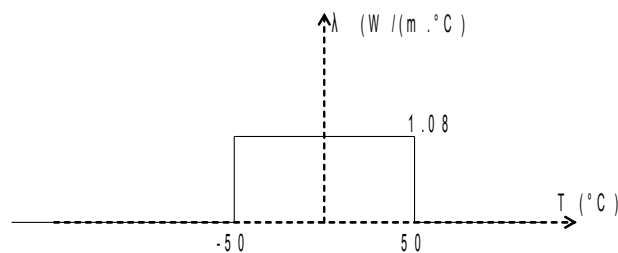
LBC : segment BC

LCD : segment CD

LDA : segment AD

1.2 Properties of the material

•Conduction



•Enthalpy

Temperature ($^{\circ}C$)	Enthalpy (J)
-50.	0
-0.25	49.75
-0.15	120.010

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50.	169.860
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1.3 Boundary conditions and loadings

$T = -45^{\circ}C$ of $t = 0.sec$ with $t = 10.sec$

1.4 Initial conditions

$T = 0^{\circ}C$ with $t = 0.sec$

2 Reference solution

2.1 Variables reference

the solution is deduced from the following publication (chapter 4, "Numerical examples"):
Solidification problems by the boundary element method. Nicholas ZABARAS and S MUKHERJEE.
Int Newspaper of Solids Structures. Pergamon. Vol. 31, No 12/13, pp. 1829-1846, 1994

2.2 Result of reference

$t(s)$	Points	Quantity ($^{\circ}C$)	Reference
1	<i>F</i>	<i>TEMP</i>	-11.8
2	<i>F</i>	<i>TEMP</i>	-29.9
3	<i>F</i>	<i>TEMP</i>	-34.7
4	<i>F</i>	<i>TEMP</i>	-36.7

1	<i>E</i>	<i>TEMP</i>	0
2	<i>E</i>	<i>TEMP</i>	-18.1
3	<i>E</i>	<i>TEMP</i>	-25.2
4	<i>E</i>	<i>TEMP</i>	-29.3

4 Summary of the results

the results got in the case of a thermal modelization `PLAN_DIAG` are satisfactory.