

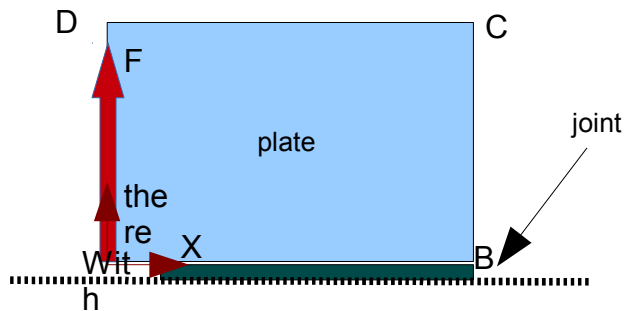
SDNS105 – Simulation of a test of wrenching in dynamics with cohesive elements

Summary:

The objective of this test is to validate in nonlinear dynamics of the elements at cohesive zone of type CZM_EXP_REG. One simulates a test of wrenching of a square plate jointée on a cohesive surface with taking into account of the heating effects. This plate is subjected to a tractive effort. The joint is beforehand heated and obeys a law of brittle fracture RUPT_FRAG_F0 characteristic of elements CZM_*.

1 Problem of reference

1.1 Geometry



One considers a square of with dimensions 100 mm jointée on a cohesive surface on the reference axis x . The joint is modelled by a fine plate thickness $0,1\text{ mm}$.

1.2 Properties of material

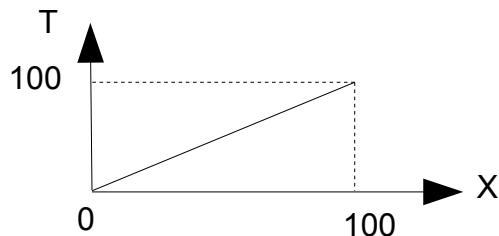
Plate :

The material of the plate is elastic isotropic with a thermal dilation coefficient no one whose properties are:

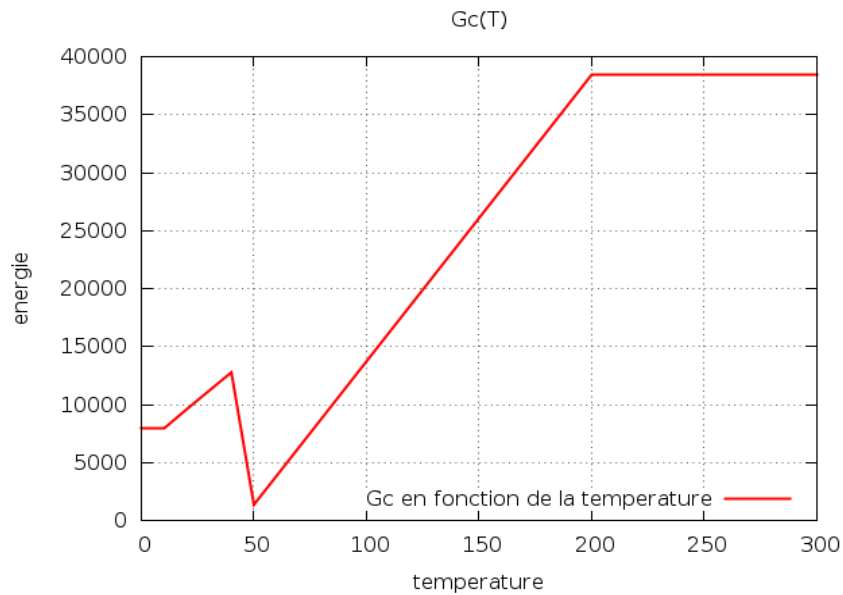
- $E = 2.E11\text{ MPa}$
- $\nu = 0.3$
- $\alpha = 0.3$
- $\rho = 750\text{ kg/mm}^3$

Joint :

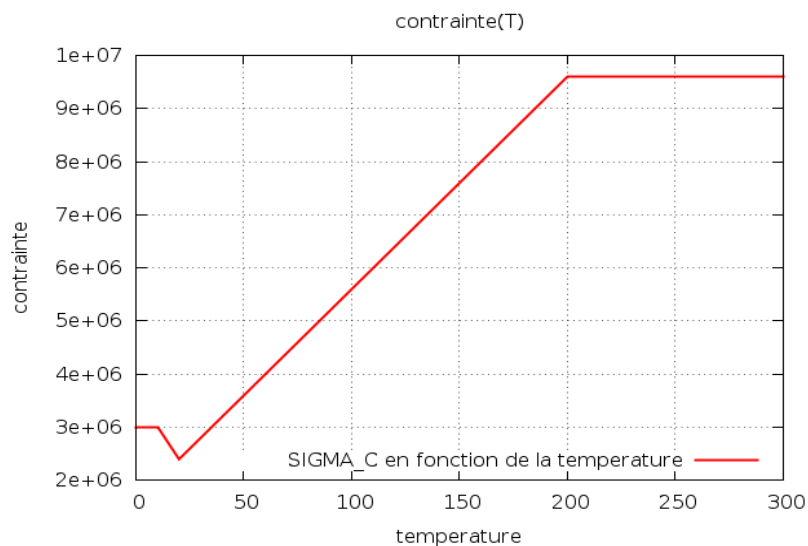
- Distribution of the temperature of the temperature in the joint:
The joint is heated beforehand and the distribution of the temperature is linear according to X .



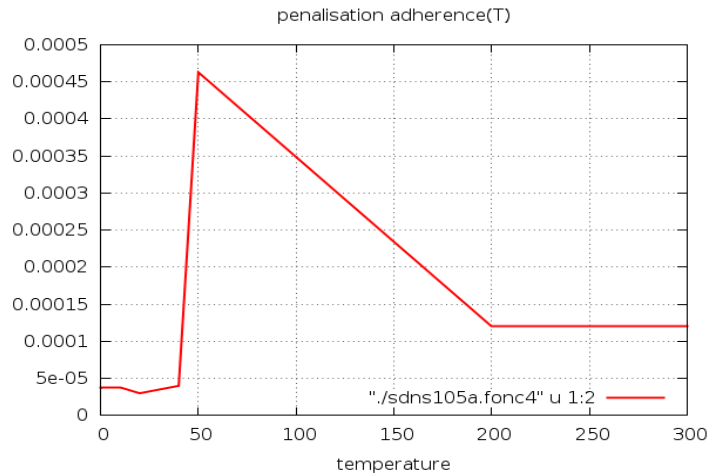
- The joint obeys a law of brittle fracture of Marigo-Frankfurt with dependence of the temperature RUPT_FRAG_F0.
- GC: density of energy criticizes joint



- SIGM_C: Constraint criticizes in the beginning



- PENA_ADHERENCE: parameter of regularization in zero



- PENA_LAGR=100, RIGI_GLIS=10,

1.3 Boundary conditions and loadings

The opening is modelled by a nodal force exerted on point A $15.18750 E8 N$.

1.4 Initial conditions

Initial acceleration and worthless initial speed. One simulates the problem of 0 with 0,01s.

2 Reference solution

2.1 Method of calculating

The cas-test is of not-regression. It is used to make checks of functionality of CZM_EXP_REG in dynamics.

2.2 Sizes and results of reference

One tests internal variables VARI_NOEU :

- V2: indicator of dissipation (0 =décharge, 1=dissipation)
- V4: indicator of damage or percentage of energy of dissipated surface (0 operational joint, 1 broken joint, $0 < V4 < 1$ damaged joint)

Nodes tested on the line of opening of the joint at the moment 0,00825s :

- N6 (10, - 0.1)
- N116 (20.2847, - 0.1)
- N110 (29,891, - 0.1)
- N106 (40.7025, - 0.1)
- N101 (62.6306, - 0.1)

2.3 Uncertainties on the solution

Tests of not-regression.

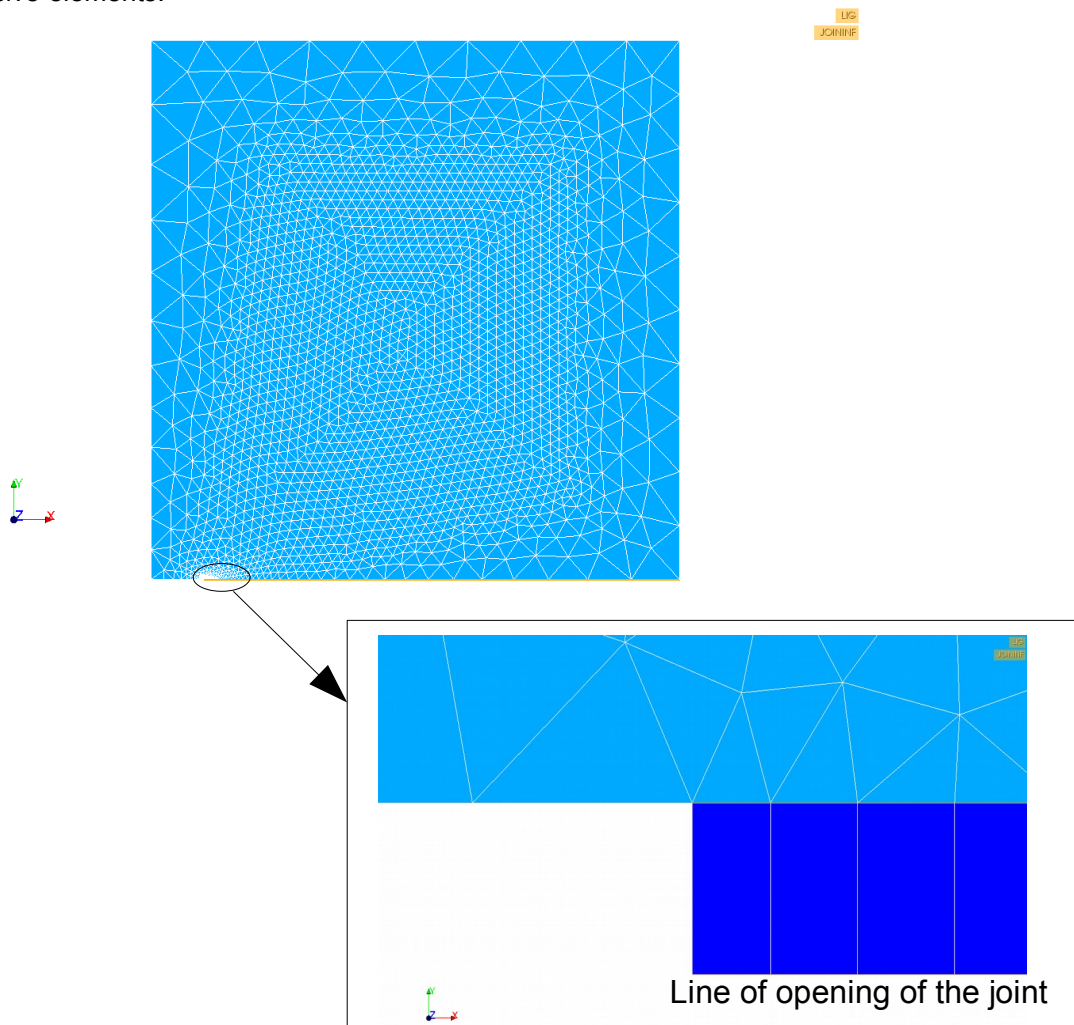
3 Modeling A

3.1 Characteristics of modeling

A modeling is used D_PLAN. One uses a diagram of NEWMARK standard in formulation DISPLACEMENT.

3.2 Characteristics of the grid

The grid contains 3810 elements of the type TRIA3 for the plate and 50 elements QUAD4 for the cohesive elements.



3.3 Sizes tested and results

The cas-tests are of not-regression.

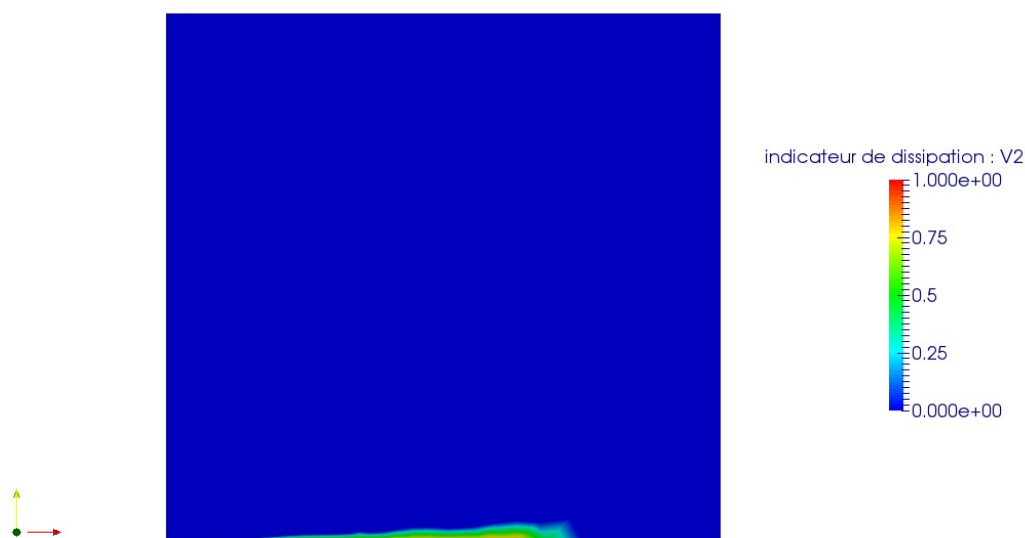
4 Summary of the results

The figure below watch the distribution of the indicator of dissipation in the joint.

It should be stressed that in terms of robustness, a certain number of digital parameters were not in particular tested the influence of:

- diagrams in time for nonregular dynamics,
- parameters of penalization for the joints,
- influence of the grid.

The test checks the good performance in dynamics of the elements of cohesive zone (CZM_EXP_REG).



Distribution of the indicator of dissipation in the joint