GCPC002 - Prismatic test-tube fissured in 3D

Summary:

This case test of elastic design is resulting from an industrial problem. It makes it possible to qualify the solvor GCPC hasvec various préconditionneurs.

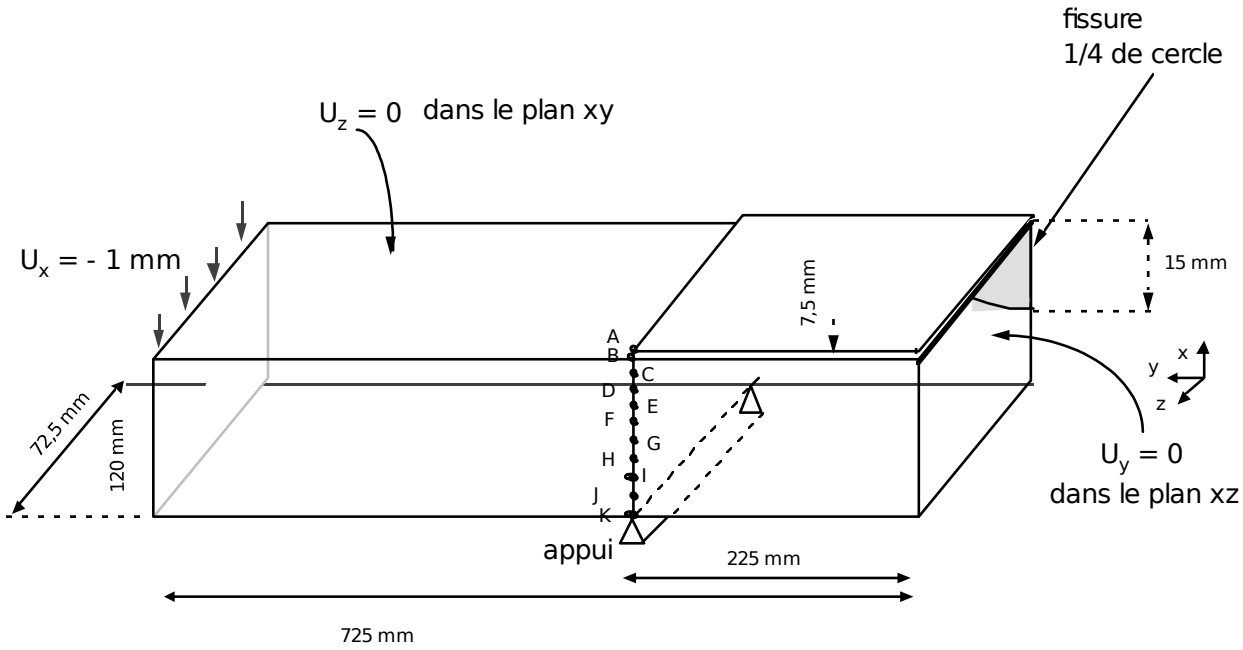
The values of reference result from a calculation carried out on the grid with code PERMAS.

The test comprises 3 modelings on the same problem of reference: modeling 3D of a prismatic quarter of test-tube fissured in 4784 pentahedrons with 15 nodes and 598 hexahedrons with 20 nodes, are 16565 nodes.

In the previous models, this case test was named SSLV103 and YYYY104.

1 Problem of reference

1.1 Geometry



Cote en x : (mm)	A : 127.5	D : 105.00	G : 60.00	J : 15.00
	B : 123.75	E : 90.00	H : 45.00	K : 0.00
	C : 120.00	F : 75.00	I : 30.00	

1.2 Material properties

$E = 210000\,MPa$

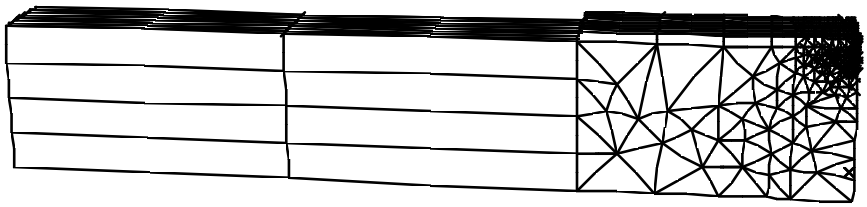
$\nu = 0.3$

1.3 Boundary conditions and loadings

$U_z = 0$	in the plan:	$Z = 0$	
$U_x = 0$	on the segment:	$X = 0$	$Y = 225$
$U_y = 0$	in the plan:	$Y = 0$	out of the crack
$U_x = -1$	on the segment:	$X = 120$	$Y = 725$

2 Modeling of reference

2.1 Modeling common to all the tests



A	⇒	NO13943	G	⇒	NO15862
B	⇒	NO13944	H	⇒	NO15863
C	⇒	NO15854	I	⇒	NO15868
D	⇒	NO15855	J	⇒	NO15869
E	⇒	NO15858	K	⇒	NO15866
F	⇒	NO15860			

2.1.1 Grid

Many nodes: 16565

Many meshs and types: 598 HEXA20 , 4784 PENTA15.

2.1.2 Boundary conditions

in all the nodes of the plan $Y=0$ except crack	(GROUP_NO=' Supy', DY=0.)
in all the nodes of the segment $X=0$ $Y=225$	(GROUP_NO=' Appui', DX=0.)
in all the nodes of the plan $Z=0$	(GROUP_NO=' Supz', DZ=0.)
in all the nodes of the segment $X=120$ $Y=725$	(GROUP_NO=' Charge', DX=-1.)

3 Reference solution

3.1 Method of calculating used for the reference solution

The reference solution is that obtained on the same grid with code PERMAS (Version 3.12), calculations carried out in 1997.

3.2 Result of reference: values tested

Identification	Reference	*Tolerance (%)*
With DX	0.31725E-02	1.E-3
With DY	0.28244E-01	1.E-3
With DZ	– 0.29278E-02	1.E-3
B DX	0.38304E-02	1.E-3
B DY	– 0.31279E-02	1.E-3
B DZ	0.48316E-03	1.E-3
C DX	0.00000E+00	1.E-3
C DY	– 0.67226E-01	1.E-3
C DZ	0.58204E-02	1.E-3

4 Modeling A

4.1 Characteristics of modeling

Modeling is characterized by the choices of imposition of boundary conditions and the sequence of the orders of following resolution.

Orders

NUME DDL	METHOD	'GCPC'
	RENUM	'WITHOUT'
TO FACTORIZE	PRE COND	'LDLT INC'
TO SOLVE		
TO FACTORIZE	PRE COND	'LDLT SP'
TO SOLVE		

5 Modeling B

5.1 Characteristics of modeling

Modeling is characterized by the choices of imposition of boundary conditions and the sequence of the orders of following resolution.

Orders

NUME DDL	METHOD	'GCPC'
	RENUM	'RCMK'
TO FACTORIZE	PRE COND	'LDLT INC'
TO SOLVE		
TO FACTORIZE	PRE COND	'LDLT SP'
TO SOLVE		

6 Modeling C

6.1 Characteristics of modeling

Modeling is characterized by the choices of imposition of boundary conditions and the sequence of the orders of following resolution.

Orders

MECA STATIQUE	SOLVEUR	METHOD	'GCPC'
		RENUM	'WITHOUT'
		PRE COND	'LDLT INC'
MECA STATIQUE	SOLVEUR	METHOD	'GCPC'
		RENUM	'WITHOUT'
		PRE COND	'LDLT SP'

7 Summary of the results

The various approaches of resolution make it possible to obtain the same precision of the results.