# GCPC002 - Prismatic test-tube fissured in 3D

**Summarized:**

This case test of elastic design is resulting from an industrial problem. It makes it possible to qualify the solver PCG with various preconditioners.

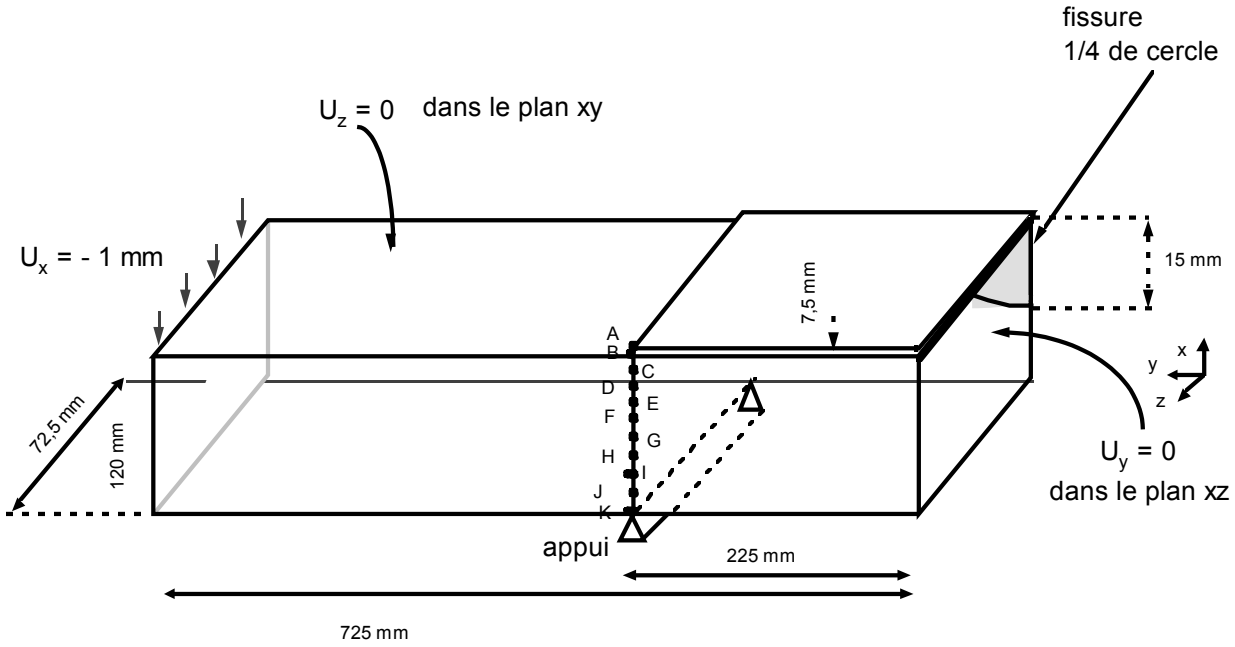
The values of reference result from a computation carried out on the mesh with code PERMAS.

The test comprises 3 modelizations on the same problem of reference: modelization 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

$E = 210000\ MPa$

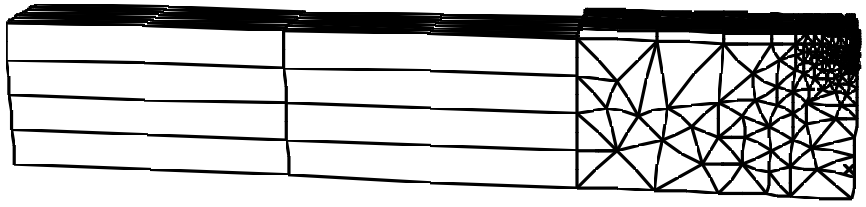
$\nu = 0.3$

## 1.3 Boundary conditions and loadings

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

# 2 Modelization of reference

## 2.1 Modelization 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 Mesh

Many nodes: 16565

Number of meshes and types: 598 HEXA20 , 4784 PENTA15.

### 2.1.2 Boundary conditions

| | |
|---|---|
| in all the nodes of the plane $Y=0$ except crack | (GROUP_NO=' Supy', DY=0.) |
| in all the nodes of segment $X=0 \quad Y=225$ | (GROUP_NO=' Appui', DX=0.) |
| in all the nodes of plane $Z=0$ | (GROUP_NO=' Supz', DZ=0.) |
| in all the nodes of segment $X=120 \quad Y=725$ | (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 mesh with code PERMAS (Version 3.12), computations carried out in 1997.

## 3.2 Result of reference: values tested

| Identification | Reference | *Tolerance (%)* |
|---|---|---|
| A DX | 0.31725E-02 | 1.E-3 |
| A DY | 0.28244E-01 | 1.E-3 |
| A 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 Modelization A

## 4.1 Characteristic of the modelization

The modelization is characterized by the choices of imposition of boundary conditions and the sequence of the commands of following resolution.

**Commands**

| | | |
|---|---|---|
| NUME DDL | METHODE | "PCG" |
| | RENUM | "SANS" |
| TO FACTORIZE | PRE COND | "LDLT INC" |
| TO SOLVE | | |
| TO FACTORIZE | PRE COND | "LDLT SP" |
| TO SOLVE | | |

# 5 Modelization B

## 5.1 Characteristic of the modelization

The modelization is characterized by the choices of imposition of boundary conditions and the sequence of the commands of following resolution.

**Commands**

| | | |
|---|---|---|
| NUME DDL | METHODE | "PCG" |
| | RENUM | "RCMK" |
| TO FACTORIZE | PRE COND | "LDLT INC" |
| TO SOLVE | | |
| TO FACTORIZE | PRE COND | "LDLT SP" |
| TO SOLVE | | |

# 6 Modelization C

## 6.1 Characteristic of the modelization

The modelization is characterized by the choices of imposition of boundary conditions and the sequence of the commands of following resolution.

**Commands**

| | | | |
|---|---|---|---|
| MECA STATIQUE | solver | METHODE | "PCG" |
| | | RENUM | "SANS" |
| | | PRE COND | "LDLT INC" |
| MECA STATIQUE | solver | METHODE | "PCG" |
| | | RENUM | "SANS" |
| | | PRE COND | "LDLT SP" |

# 7 Summary of the results

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