

## ZZZZ106 - Geometrical criteria in DEFI\_GROUP

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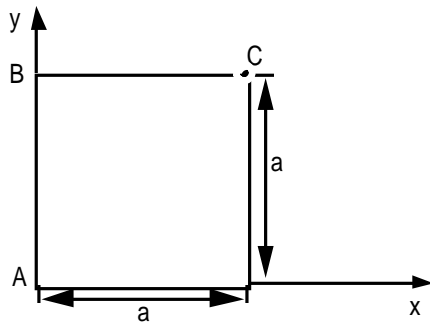
### Summarized:

This test validates the various options of creation of mesh groups (or nodes) by geometrical **criteria** in command DEFI\_GROUP :

- "SPHERE"
- "CYLINDRE"
- "BANDAGES"
- "FACE\_NORMALE"
- "ENV\_SPHERE"
- "ENV\_CYLINDRE"
- "PLANE"

## 1 Problem of reference

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It acts of a square plate on side  $a=10$ . and thickness  $t=1$  .

### 1.1 Material properties

$$E=1.$$
$$\nu=0.3$$

### 1.2 Boundary conditions and loading

the plate is embedded along the side  $AB$  .

There are 7 loading cases for the modelization A and 5 loading cases for the modelization B.

Each loading case correspond to the superposition of 2 loadings which are cancelled.

One of these loadings applies to a `GROUP_MA` or a `GROUP_NO` defined from a geometrical criterion in `DEF1_GROUP`, the other, of opposed sign, applies to the `GROUP_MA` or the `GROUP_NO` defined "in extension" (with the hand).

The modelization A uses a model "3D" in shell `DKT`.

The modelization B uses a model "D\_PLAN" in `TRIA3`.

The meshes are the same ones.

## 2 Reference solution

### 2.1 Results of reference

For all the loading cases, the solution is commonplace.

One must have a field of null displacements in all the nodes.

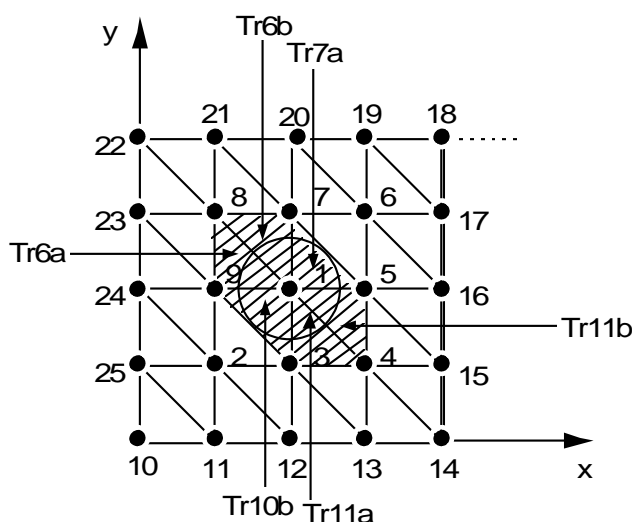
## 3 Modelization A

### 3.1 Characteristic of the modelization

the elements are DKT.

One defines 7 loading cases in the following way:

#### N°1 loading case: SPHERE

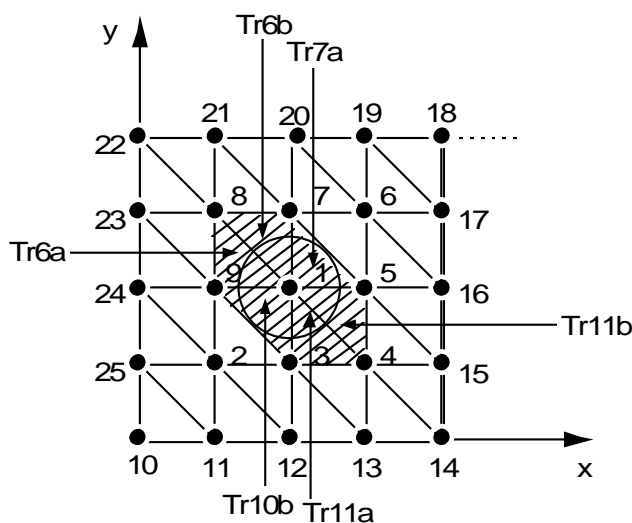


the side of an element is equal to 2.5 .

The sphere of radius 2. and centered with node 1 has an intersection NON-vacuum with the element hatched on the figure, i.e. *Tr6a* *Tr6b* *Tr7a*, *Tr10b* and *Tr11a* . *Tr11b* One

applies a pressure equal to  $-1$ . this list of name built *GM1* by means of option "SPHERE" of CREA\_GROUP\_MA of the command DEFI\_GROUP and a pressure equal to on 1. this list defined in extension. N°2

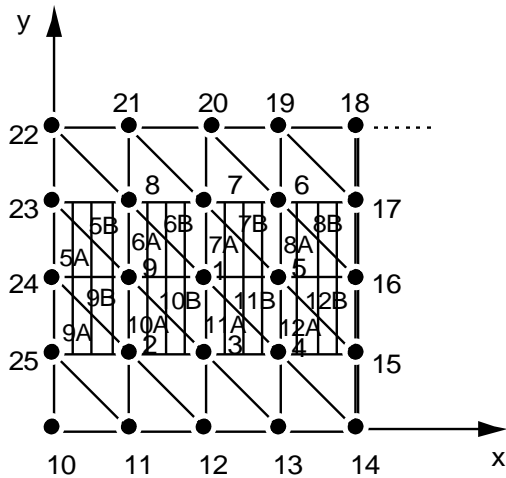
#### loading case: CYLINDRE



the cylinder of radius of 2 axis and  $z$  passing by the node has 1 an intersection not - vacuum with the elements hatched on the figure is *Tr6a* *Tr6b* *Tr7a*, *Tr10b* and *Tr11a* . *Tr11b* One

applies a pressure equal to  $-1$ . this list of name built *GM2* by means of option "CYLINDRE" of CREA\_GROUP\_MA of the command DEFI\_GROUP and a pressure equal to 1. on this list defined in extension. N°3

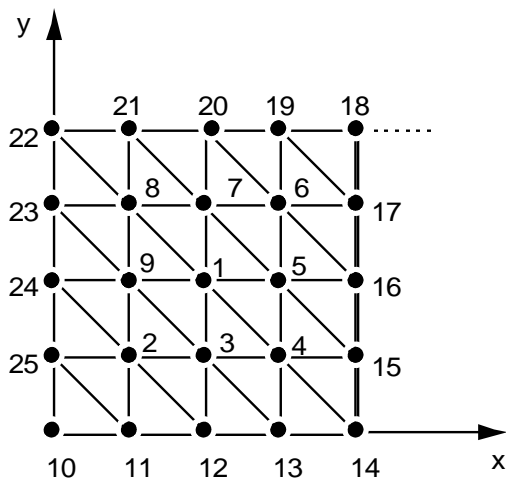
## loading case: BANDAGE



the elements of the shaded zone i.e.  $Tr5A$   $Tr5B$   $Tr6A$   $Tr6B$   $Tr7A$   $Tr7B$   $Tr8A$   $Tr8B$   $Tr9A$   $Tr9B$   $Tr10A$   $Tr10B$   $Tr11A$ ,  $Tr11B$  define  $Tr12A$   $Tr12B$  the intersection of the plate with the tape whose sides are parallel to the axis, whose  $x$  medium passes by the node, and  $NI$  of which the half-width is equal to. One 2 applies

a pressure equal to this  $-1$ . defined zone thus geometrically of name by employing  $GM3$  the option "of the command BANDAGES"  $CREA\_GROUP\_MA$   $DEFI\_GROUP$  and a pressure equal to on this 1. zone defined in extension. N°4

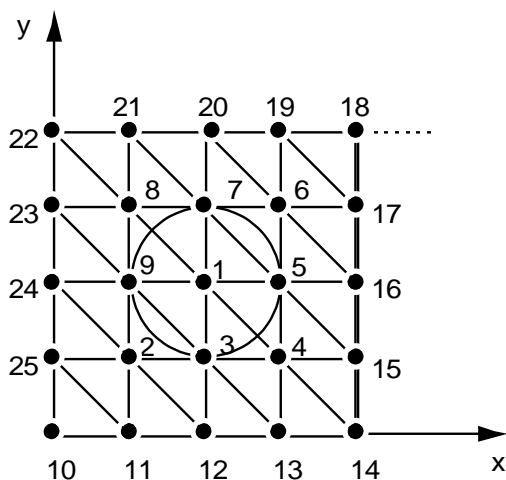
## loading case: FACE\_NORMALE One defines



the elements of the plate as being perpendicular to the axis by means of  $z$  option "FACE\_NORMALE" of  $CREA\_GROUP\_MA$  of the command  $DEFI\_GROUP$ . One applies

a pressure equal to this  $-1$ . list of name and  $GM4$  a pressure equal to 1. the same list defined in extension (here all meshes). N°5

## loading case: ENV\_SPHERE nodes

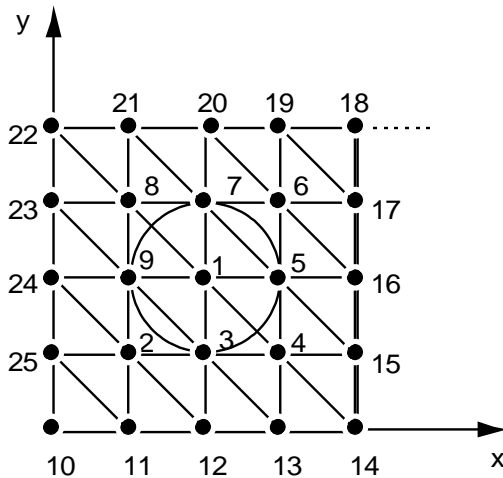


3,5,7 and 9 are defined as being the nodes of the mesh pertaining to the intersection of the plate with the sphere of center and  $NI$  radius (it is 2.5 the length on the side of an element). This

nodes list of name is defined  $GNI$  by means of option "ENV\_SPHERE" of  $CREA\_GROUP\_NO$  of the command  $DEFI\_GROUP$ . One applies

a nodal force of each  $F_z = -1$  node of this list and a nodal force of each  $F_z = 1$  node of the same list defined in extension. N°6 ( $N3, N5, N7, N9$ )

## loading case: ENV\_CYLINDRE nodes

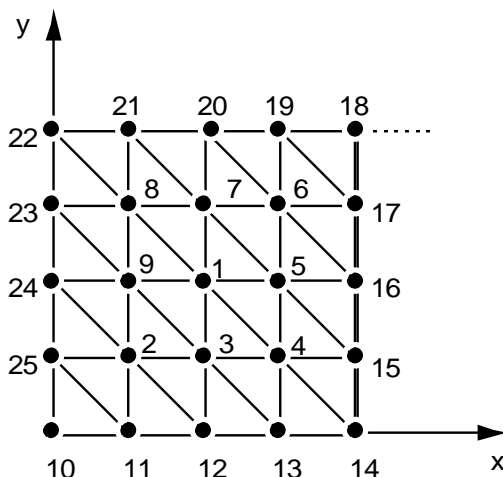


3,5,7 and 9 are defined as being the nodes of the mesh pertaining to the intersection of the plate with the cylinder of axis passing  $z$  by node 1 and of radius 2.5. This

nodes list of name is defined  $GN2$  by means of option "ENV\_CYLINDRE" of CREA\_GROUP\_NO of the command DEF1\_GROUP . One applies

a nodal force of each  $F_z = -1$  node of this list and a nodal force of each  $F_z = 1$  node of the same list defined in extension. N°7 (N3, N5, N7, N9)

## loading case: " PLANE " nodes



14,15,16,17 and 18 are definite as belonging to plane passing by the node 14 and whose norm is parallel to. This  $x$

nodes list of name is defined  $GN3$  by means of the option "PLANE" of CREA\_GROUP\_NO of the command GROUP\_NO . One applies

a nodal force of each  $F_z = -1$  node of this list and a nodal force of each  $F_z = 1$  node of the same list defined in extension. Characteristics

## 3.2 of the mesh The mesh

comprises 32 meshes DKT. Functionalities

## 3.3 tested One of the command

tests the following options of creation of mesh group DEF1\_GROUP for 3D: "SPHERE

- " "CYLINDRE
- " "BANDAGES
- " "FACE\_NORMALE
- and the"

following options of creation of nodes group of the command DEF1\_GROUP : "ENV\_SPHERE

- " "ENV\_CYLINDRE
- " "PLANE
- " Results

## 4 of the modelization A Values

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### 4.1 tested Identification

Reference	n°1
Loading case: 0. N°2	
<i>DZ (C)</i>	
loading case: 0. N°3	
<i>DZ (C)</i>	
loading case: 0. N°4	
<i>DZ (C)</i>	
loading case: 0. N°5	
<i>DZ (C)</i>	
loading case: 0. N°6	
<i>DZ (C)</i>	
loading case: 0. N°7	
<i>DZ (C)</i>	
loading case: 0. Remarks	
<i>DZ (C)</i>	

### 4.2 the values

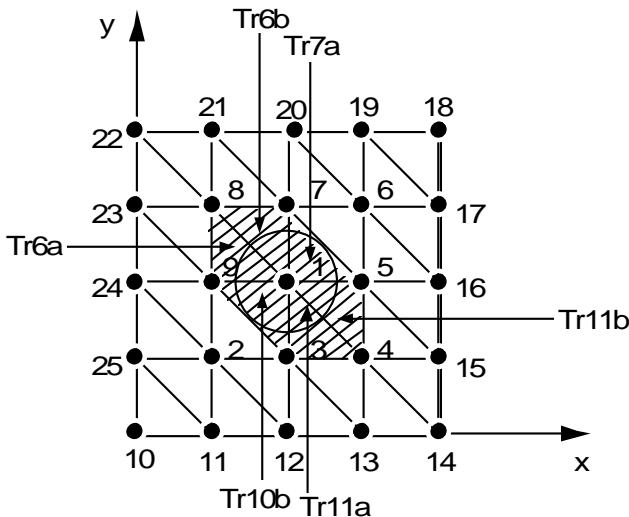
are tested in absolute and the tolerance is equal to. Modelization  $1.E-10$

## 5 B Characteristic

### 5.1 of the modelization the elements

are TRIA3 in plane strain. One defines 5 loading cases in the following way: N°1

loading case: SPHERE the side

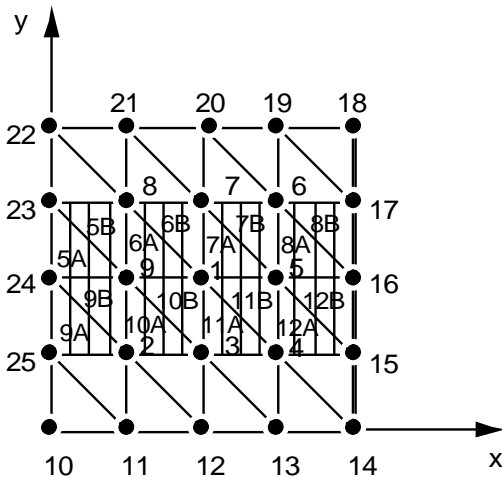


of an element is equal to. 2.5 The circle

of radius 2. and centered with node 1 has an intersection NON-vacuum with the element hatched on the figure, i.e. *Tr6a*, *Tr6b* and *Tr7a*. *Tr10b* One *Tr11a* applies *Tr11b*

a volume force of density  $-1$  according to this  $y$  zone of name defined *GMI* by employing option "SPHERE" of *CREA\_GROUP\_MA* of the command *DEF1\_GROUP* and a volume force opposed to this zone defined in extension. N°2

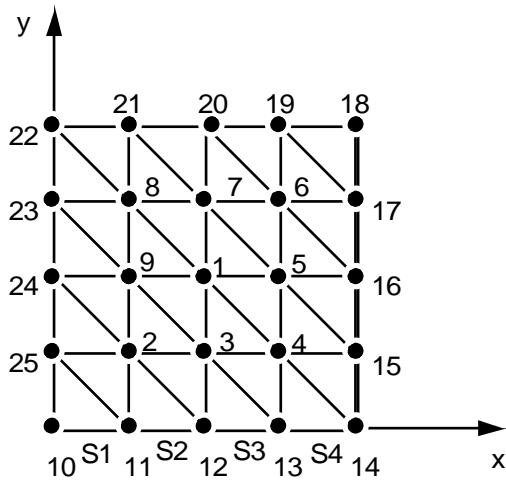
loading case: BANDAGE the elements



of the shaded zone i.e. *Tr5A* *Tr5B* *Tr6A* *Tr6B* *Tr7A* *Tr7B* *Tr8A* *Tr8B* *Tr9A* *Tr9B*, *Tr10A* *Tr10B*, *Tr11A* define *Tr11B* *Tr12B* the intersection of the plate with the tape whose sides are parallel to the axis, whose medium  $x$  passes by the node, and of which  $NI$  the half-width is equal to. One applies 2

a volume force of density according to  $-1$  this defined  $y$  zone thus geometrically of name by employing *GM3* the option "of the command BANDAGES" *CREA\_GROUP\_MA* *DEF1\_GROUP* and volume force of opposite density to 1. the preceding one on this same zone defined in extension. N°3

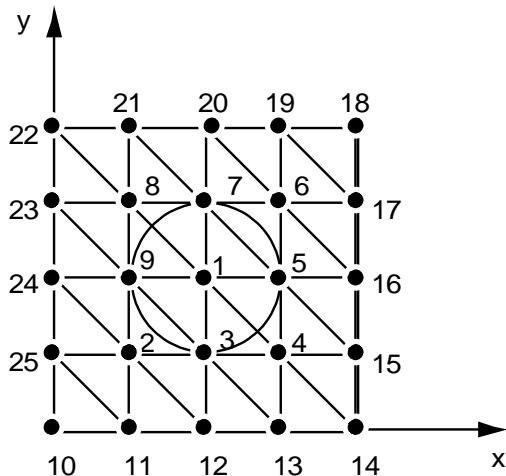
loading case: **FACE\_NORMALE** the list of



the elements of the geometrical type SEG2 , is  $S1$  defined  $S2$   $S3$   $S4$  as the list of the elements of the mesh perpendicular to the direction. One applies  $y$

a pressure equal to this list  $-1$  of name definite geometrically  $GM4$  in the way indicated, by employing option "FACE\_NORMALE" of CREA\_GROUP\_MA of the command DEF1\_GROUP and a pressure with on this same 1. list defined in extension. N°4

loading case: **ENV\_SPHERE** nodes

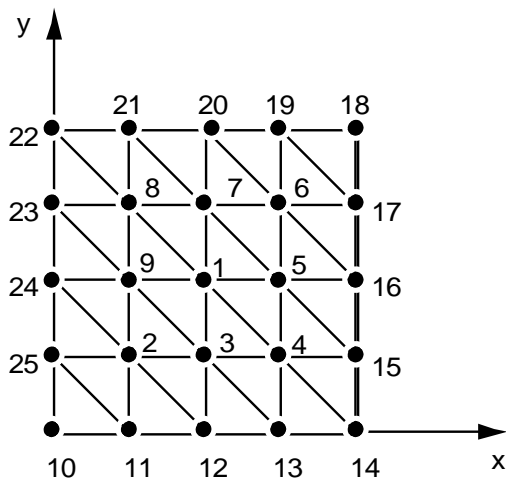


3,5,7 and 9 are defined as being the nodes of the mesh pertaining to the intersection of the plate with the circle of center and radius  $NI$  (it is the length 2.5 on the side of an element). This nodes list

of name is defined  $GN1$  by means of option "ENV\_SPHERE" of CREA\_GROUP\_NO of the command DEF1\_GROUP. One applies

a nodal force of each  $F_y = -1$  node of this list and a nodal force of each  $F_y = 1$  node of the same list defined in extension. N°5

loading case: **PLANE** nodes



14,15,16,17 and 18 are definite as pertaining to the right passing by the node 14 and whose norm is parallel to. This nodes list  $x$

of name is defined  $GN3$  by means of the option "PLANE" of CREA\_GROUP\_NO of the command GROUP\_NO. One applies

a nodal force of each  $F_y = -1$  node of this list and a nodal force of each  $F_y = 1$  node of the same list defined in extension. Characteristics



## 5.2 of the mesh The mesh

comprises 32 meshes TRIA3 and 4 meshes SEG2. Functionalities

## 5.3 tested One of the command tests

the following options of creation of mesh group DEFI\_GROUP for 2D: "SPHERE" "BANDAGES

- " "FACE\_NORMALE
- 
- and the" following

options of creation of nodes group of the command DEFI\_GROUP for 2D: "ENV\_SPHERE

- " "PLANE" Results
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## 6 of the modelization B Values tested

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### 6.1 Identification

Reference	n°1
Loading case: 0. N°2	
<i>DY (C)</i>	
loading case: 0. N°3	
<i>DY (C)</i>	
loading case: 0. N°4	
<i>DY (C)</i>	
loading case: 0. N°5	
<i>DY (C)</i>	
loading case: 0. Remarks	
<i>DY (C)</i>	

### 6.2 the values

are tested in absolute and the tolerance is equal to. Summary  $1.E - 10$  of

## 7 the results the results

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are good: groups calculated by the command DEFI\_GROUP are well the expected groups. Attention however

with the fact that the test 3D is actually a test on a plate in the plane: the role *XOY* of the 3rd coordinate in FORTRAN is thus not tested.