SSNV167 – Contact for the quadratic elements

Abstract:

This problem corresponds to a quasi-static analysis of a problem of mechanics with contact. It is about a very elementary test on quality of projection Master/slave and on the geometrical reactualization, in particular on meshes quadratic the nonplane ones.

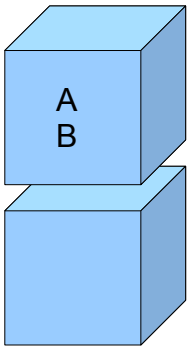
This test comprises 5 modelizations:

- Modelization a: with a linear mesh (QUAD4) in formulation of contact DISCRETE and with REAC_GEOM=' CONTRÔLE' ;
- Modelization b: with a quadratic mesh (QUAD8) in formulation of contact DISCRETE and with REAC_GEOM=' CONTRÔLE' ;
- Modelization C: with a quadratic mesh (QUAD9) in formulation of contact DISCRETE and with REAC_GEOM=' CONTRÔLE' ;
- Modelization D: with a linear mesh (QUAD4) in formulation of contact CONTINUE ;
- Modelization E: with a linear mesh (QUAD4) in formulation of contact DISCRETE , method GCP and with REAC_GEOM=' AUTOMATIQUE' ;
- Modelization F: with a linear mesh (QUAD 8) in formulation of contact CONTINUE ;
- Modelization G: with a linear mesh (QUAD 9) in formulation of contact CONTINUE .

1 Problem of reference

1.1 Geometry

One considers two cubes A and B of with dimensions $a=2\,mmm$. The two cubes are initially contact (not clearance makes A and B).



Voici the position of the points of reference (mm):

Cubic	Item	x	y	z
A	$NH1$	2	0	2
A	$NH2$	2	2	2
A	$NH3$	0	2	2
A	$NH4$	0	0	2
A	$NH5$	2	0	4
A	$NH6$	2	2	4
A	$NH7$	0	2	4
A	$NH8$	0	0	4
A	$NH9$	2	1	2
A	$NH10$	1	2	2
A	$NH11$	0	1	2
A	$NH12$	1	0	2
A	$NH17$	2	1	4
A	$NH18$	1	2	4
A	$NH19$	0	1	4
A	$NH20$	1	0	4
A	$NH26$	1	1	4
A	$NH21$	1	1	2
B	$NB1$	2	0	0
B	$NB2$	2	2	0
B	$NB3$	0	2	0
B	$NB4$	0	0	0
B	$NB5$	2	0	2
B	$NB6$	2	2	2
B	$NB7$	0	2	2
B	$NB8$	0	0	2
B	$NB17$	2	1	2

B	NB18	1	2	2
B	NB19	0	1	2
B	NB20	1	0	2
B	NB26	1	1	2
B	NB9	2	1	0
B	NB10	1	2	0
B	NB11	0	1	0
B	NB12	1	0	0
B	NB21	1	1	0

1.2 Properties of the materials

the two cubes are elastic with:
- Poisson's ratio: 0
- Young modulus: $200\,GPa$

1.3 Boundary conditions and loadings

One imposes a displacement $DZ=-0.2\text{mm}$ on the cube A. The two cubes are in contact without friction.

2 Reference solution

2.1 Method of calculating

the reference solution is analytical: the test is elementary, the cube is strain homogeneous according to z (null Poisson's ratio). The force is thus distributed according to the values of the shape functions on the nodes of the interface.

2.2 Quantities and results of reference

For a displacement of $0.2\,mm$ to the bottom of the cube A, one must find (for the QUAD4):

Cubic	Point	DEPL	REAC_NODA
		DZ	DZ
A	NH1	-0,1	10000
A	NH2	-0,1	10000
A	NH3	-0,1	10000
A	NH4	-0,1	10000
A	NH9	-0,1	10000
A	NH10	-0,1	10000
A	NH11	-0,1	10000
A	NH12	-0,1	10000
A	NH21	-0,1	10000
B	NB5	-0,1	- 10000
B	NB6	-0,1	- 10000
B	NB7	-0,1	- 10000
B	NB8	-0,1	- 10000
B	NB17	-0,1	- 10000
B	NB18	-0,1	- 10000
B	NB19	-0,1	- 10000

B	NB20	-0,1	- 10000
B	NB26	-0,1	- 10000

For a displacement of $0.2\,mm$ to the bottom of the cube A, one must find (for the QUAD8):

Cubic	Point	DEPL	REAC_NODA
		DZ	DZ
A	NH1	-0,1	- 10000/3
A	NH2	-0,1	- 10000/3
A	NH3	-0,1	- 10000/3
A	NH4	-0,1	- 10000/3
A	NH9	-0,1	(4* 10000)/3
A	NH10	-0,1	(4* 10000)/3
A	NH11	-0,1	(4* 10000)/3
A	NH12	-0,1	(4* 10000)/3
B	NB5	-0,1	10000/3
B	NB6	-0,1	10000/3
B	NB7	-0,1	10000/3
B	NB8	-0,1	10000/3
B	NB17	-0,1	- (4* 10000)/3
B	NB18	-0,1	- (4* 10000)/3
B	NB19	-0,1	- (4* 10000)/3
B	NB20	-0,1	- (4* 10000)/3

For a displacement of $0.2\,mm$ to the bottom of the cube A , one must find (for QUADS 9):

Cubic	Point	DEPL	REAC_NODA
		DZ	DZ
A	NH1	-0,1	10000/9
A	NH2	-0,1	10000/9
A	NH3	-0,1	10000/9
A	NH4	-0,1	10000/9
A	NH9	-0,1	(4* 10000)/9
A	NH10	-0,1	(4* 10000)/9
A	NH11	-0,1	(4* 10000)/9
A	NH12	-0,1	(4* 10000)/9
A	NH21	-0,1	(16 * 10000)/9
B	NB5	-0,1	- 10000/9
B	NB6	-0,1	- 10000/9
B	NB7	-0,1	- 10000/9
B	NB8	-0,1	- 10000/9
B	NB17	-0,1	- (4* 10000)/9
B	NB18	-0,1	- (4* 10000)/9
B	NB19	-0,1	- (4* 10000)/9
B	NB20	-0,1	- (4* 10000)/9
B	NB26	-0,1	- (16 * 10000)/9

For the formulation continues, one tests contact pressures LAGS_C besides nodal reactions REAC_NODA. They is the true values of pressure. One must thus find a pressure of

$p=E.(0.1/2)=10000$ on the nodes $NH1$ $NH2$ $NH3$ $NH4$ $NH9$ $NH10$ $NH11$, $NH12$ and $NH21$.

2.3 Uncertainties on the solution

No (analytical solution).

3 Modelization A

3.1 Characteristic of the modelization

The modelization is 3D.
Method of contact: formulation of contact DISCRETE , algorithm of the active stresses, with REAC_GEOM=' CONTRÔLE'.

3.2 Characteristics of the mesh

Many nodes: 8
Number of meshes and types: 2 HEXA8

3.3 Quantities tested and Standard

Identification	results of reference	Value of reference	Tolerance
DEPL, DZ at the point $NH1$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH2$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH3$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH4$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB5$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB6$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB7$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB8$	"ANALYTIQUE"	-0.1	1,0E- 6%
REAC_NODA, DZ at the point $NH1$	"ANALYTIQUE"	10000	1,0E- 6%
REAC_NODA, DZ at the point $NH2$	"ANALYTIQUE"	10000	1,0E- 6%
REAC_NODA, DZ at the point $NH3$	"ANALYTIQUE"	10000	1,0E- 6%
REAC_NODA, DZ at the point $NH4$	"ANALYTIQUE"	10000	1,0E- 6%
REAC_NODA, DZ at the point $NB5$	"ANALYTIQUE"	-10000	1,0E- 6%
REAC_NODA, DZ at the point $NB6$	"ANALYTIQUE"	-10000	1,0E- 6%
REAC_NODA, DZ at the point $NB7$	"ANALYTIQUE"	-10000	1,0E- 6%
REAC_NODA, DZ at the point $NB8$	"ANALYTIQUE"	-10000	1,0E- 6%

3.4 Remarks

the got results are perfect. Projection occurs well.

4 Modelization B

4.1 Characteristic of the modelization

The modelization is 3D.
Method of contact: formulation of contact DISCRETE , algorithm of the active stresses and with REAC_GEOM=' CONTRÔLE'.

4.2 Characteristics of the mesh

Many nodes: 40
Number of meshes and types: 2 HEXA20

4.3 Quantities tested and Standard

Identification	results of reference	Value of reference	Tolerance
DEPL, DZ at the point $NH1$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH2$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH3$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at point $NH4$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH9$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH10$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH11$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH12$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB5$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB6$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB7$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at point $NB8$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB17$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB18$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB19$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB20$	"ANALYTIQUE"	-0.1	1,0E- 6%
REAC_NODA, DZ at point $NH1$	"ANALYTIQUE"	$-10000/3$	1,0E- 6%
REAC_NODA, DZ at point $NH2$	"ANALYTIQUE"	$-10000/3$	1,0E- 6%
REAC_NODA, DZ at point $NH3$	"ANALYTIQUE"	$-10000/3$	1,0E- 6%
REAC_NODA, DZ at point $NH4$	"ANALYTIQUE"	$-10000/3$	1,0E- 6%
REAC_NODA, DZ at the point $NH9$	"ANALYTIQUE"	$(4\times10000)/3$	1,0E- 6%
REAC_NODA, DZ at the point $NH10$	"ANALYTIQUE"	$(4\times10000)/3$	1,0E- 6%
REAC_NODA, DZ at the point $NH11$	"ANALYTIQUE"	$(4\times10000)/3$	1,0E- 6%
REAC_NODA, DZ at the point $NH12$	"ANALYTIQUE"	$(4\times10000)/3$	1,0E- 6%
REAC_NODA, DZ at point $NB5$	"ANALYTIQUE"	$10000/3$	1,0E- 6%
REAC_NODA, DZ at point $NB6$	"ANALYTIQUE"	$10000/3$	1,0E- 6%
REAC_NODA, DZ at point $NB7$	"ANALYTIQUE"	$10000/3$	1,0E- 6%
REAC_NODA, DZ at point $NB8$	"ANALYTIQUE"	$10000/3$	1,0E- 6%
REAC_NODA, DZ at point $NB17$	"ANALYTIQUE"	$-(4\times10000)/3$	1,0E- 6%
REAC_NODA, DZ at point $NB18$	"ANALYTIQUE"	$-(4\times10000)/3$	1,0E- 6%
REAC_NODA, DZ at point $NB19$	"ANALYTIQUE"	$-(4\times10000)/3$	1,0E- 6%

REAC_NODA, DZ at point $NB20$	"ANALYTIQUE"	$-(4\times10000)/3$	1,0E- 6%

4.4 Remarks

the got results are perfect. Projection occurs well. The positive NON-definite shape functions of the QUAD8 gives us results which “oscillate”, which is false from the mechanical point of view, but in conformity with the approximation.

5 Modelization C

5.1 Characteristic of the modelization

The modelization is 3D.
Method of contact: formulation of contact DISCRETE , algorithm of the active stresses and with REAC_GEOM=' CONTRÔLE'.

5.2 Characteristics of the mesh

Many nodes: 54
Number of meshes and types: 2 HEXA27

5.3 Quantities tested and Standard

Identification	results of reference	Value of reference	Tolerance
DEPL, DZ at the point $NH1$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH2$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH3$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH4$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH9$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH10$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH11$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at point $NH21$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at point $NH12$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB5$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB6$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB7$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB8$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB17$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB18$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB19$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at point $NB20$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB26$	"ANALYTIQUE"	-0.1	1,0E- 6%
REAC_NODA, DZ at point $NH1$	"ANALYTIQUE"	$10000/9$	1,0E- 6%
REAC_NODA, DZ at point $NH2$	"ANALYTIQUE"	$10000/9$	1,0E- 6%
REAC_NODA, DZ at point $NH3$	"ANALYTIQUE"	$10000/9$	1,0E- 6%
REAC_NODA, DZ at point $NH4$	"ANALYTIQUE"	$10000/9$	1,0E- 6%
REAC_NODA, DZ at point $NH9$	"ANALYTIQUE"	$(4\times10000)/9$	1,0E- 6%
REAC_NODA, DZ at point $NH10$	"ANALYTIQUE"	$(4\times10000)/9$	1,0E- 6%
REAC_NODA, DZ at point $NH11$	"ANALYTIQUE"	$(4\times10000)/9$	1,0E- 6%
REAC_NODA DZ at point $NH12$	"ANALYTIQUE"	$(4\times10000)/9$	1,0E- 6%
REAC_NODA, DZ at point $NH21$	"ANALYTIQUE"	$(16\times10000)/9$	1,0E- 6%
REAC_NODA, DZ at point $NB5$	"ANALYTIQUE"	$-10000/9$	1,0E- 6%
REAC_NODA, DZ at point $NB6$	"ANALYTIQUE"	$-10000/9$	1,0E- 6%
REAC_NODA, DZ at point $NB7$	"ANALYTIQUE"	$-10000/9$	1,0E- 6%
REAC_NODA, DZ at point $NB8$	"ANALYTIQUE"	$-10000/9$	1,0E- 6%
REAC_NODA, DZ at point $NB17$	"ANALYTIQUE"	$-(4\times10000)/9$	1,0E- 6%
REAC_NODA, DZ at point $NB18$	"ANALYTIQUE"	$-(4\times10000)/9$	1,0E- 6%
REAC_NODA, DZ at point $NB19$	"ANALYTIQUE"	$-(4\times10000)/9$	1,0E- 6%

REAC_NODA, DZ at point $NB20$	"ANALYTIQUE"	$-(4\times10000)/9$	1,0E- 6%
REAC_NODA, DZ at point $NB26$	"ANALYTIQUE"	$-(16\times10000)/9$	1,0E- 6%

5.4 Remarks

the got results is perfect. Projection occurs well.

6 Modelization D

6.1 Characteristic of the modelization

The modelization is 3D.
Method of contact: formulation of contact CONTINUE .

6.2 Characteristics of the mesh

Many nodes: 8
Number of meshes and types: 2 HEXA8

6.3 Quantities tested and Standard

Identification	results of reference	Value of reference	Tolerance
DEPL, DZ at the point $NH1$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH2$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH3$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH4$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB5$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB6$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB7$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB8$	"ANALYTIQUE"	-0.1	1,0E- 6%
REAC_NODA, DZ at the point $NH1$	"ANALYTIQUE"	10000	1,0E- 6%
REAC_NODA, DZ at the point $NH2$	"ANALYTIQUE"	10000	1,0E- 6%
REAC_NODA, DZ at the point $NH3$	"ANALYTIQUE"	10000	1,0E- 6%
REAC_NODA, DZ at the point $NH4$	"ANALYTIQUE"	10000	1,0E- 6%
REAC_NODA, DZ at the point $NB5$	"ANALYTIQUE"	-10000	1,0E- 6%
REAC_NODA, DZ at the point $NB6$	"ANALYTIQUE"	-10000	1,0E- 6%
REAC_NODA, DZ at the point $NB7$	"ANALYTIQUE"	-10000	1,0E- 6%
REAC_NODA, DZ at the point $NB8$	"ANALYTIQUE"	-10000	1,0E- 6%

Standard	Identification of reference	Value of reference	Tolerance
DEPL, $LAGS\_C$ at the point $NH1$	"ANALYTIQUE"	- 10000	1,0E- 6%
DEPL, $LAGS\_C$ at the point $NH2$	"ANALYTIQUE"	- 10000	1,0E- 6%
DEPL, $LAGS\_C$ at the point $NH3$	"ANALYTIQUE"	- 10000	1,0E- 6%
DEPL, $LAGS\_C$ at the point $NH4$	"ANALYTIQUE"	- 10000	1,0E- 6%

6.4 Remarks

the got results are perfect. Projection occurs well. It is necessary to reinforce RESI_GEOM of method of Newton generalized to have good tolerances, or to pass in partial Newton or not fixes.

7 Modelization E

7.1 Characteristic of the modelization

The modelization is 3D.
Method of contact: formulation of contact DISCRETE , algorithm GCP and with REAC_GEOM=' CONTRÔLE' .

7.2 Characteristics of the mesh

Many nodes: 8
Number of meshes and types: 2 HEXA8

7.3 Quantities tested and Standard

Identification	results of reference	Value of reference	Tolerance
DEPL, DZ at the point $NH1$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH2$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH3$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH4$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB5$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB6$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB7$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB8$	"ANALYTIQUE"	-0.1	1,0E- 6%
REAC_NODA, DZ at the point $NH1$	"ANALYTIQUE"	10000	1,0E- 6%
REAC_NODA, DZ at the point $NH2$	"ANALYTIQUE"	10000	1,0E- 6%
REAC_NODA, DZ at the point $NH3$	"ANALYTIQUE"	10000	1,0E- 6%
REAC_NODA, DZ at the point $NH4$	"ANALYTIQUE"	10000	1,0E- 6%
REAC_NODA, DZ at the point $NB5$	"ANALYTIQUE"	-10000	1,0E- 6%
REAC_NODA, DZ at the point $NB6$	"ANALYTIQUE"	-10000	1,0E- 6%
REAC_NODA, DZ at the point $NB7$	"ANALYTIQUE"	-10000	1,0E- 6%
REAC_NODA, DZ at the point $NB8$	"ANALYTIQUE"	-10000	1,0E- 6%

7.4 Remarks

the got results are perfect. Projection occurs well.

8 Modelization F

8.1 Characteristic of the modelization

The modelization is 3D.
Method of contact: Method of contact: formulation of contact CONTINUE .

8.2 Characteristics of the mesh

Many nodes: 40
Number of meshes and types: 2 HEXA20

8.3 Quantities tested and Standard

Identification	results of reference	Value of reference	Tolerance
DEPL, DZ at the point $NH1$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH2$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH3$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH4$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH9$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH10$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH11$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NH12$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB5$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB6$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB7$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB8$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB17$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB18$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB19$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at the point $NB20$	"ANALYTIQUE"	-0.1	1,0E- 6%
REAC_NODA, DZ at the point $NH1$	"ANALYTIQUE"	$-10000/3$	1,0E- 6%
REAC_NODA, DZ at the point $NH2$	"ANALYTIQUE"	$-10000/3$	1,0E- 6%
REAC_NODA, DZ at the point $NH3$	"ANALYTIQUE"	$-10000/3$	1,0E- 6%
REAC_NODA, DZ at the point $NH4$	"ANALYTIQUE"	$-10000/3$	1,0E- 6%
REAC_NODA, DZ at the point $NH9$	"ANALYTIQUE"	$(4\times10000)/3$	1,0E- 6%
REAC_NODA, DZ at the point $NH10$	"ANALYTIQUE"	$(4\times10000)/3$	1,0E- 6%
REAC_NODA, DZ at the point $NH11$	"ANALYTIQUE"	$(4\times10000)/3$	1,0E- 6%
REAC_NODA, DZ at the point $NH12$	"ANALYTIQUE"	$(4\times10000)/3$	1,0E- 6%
REAC_NODA, DZ at the point $NB5$	"ANALYTIQUE"	$10000/3$	1,0E- 6%
REAC_NODA, DZ at the point $NB6$	"ANALYTIQUE"	$10000/3$	1,0E- 6%
REAC_NODA, DZ at the point $NB7$	"ANALYTIQUE"	$10000/3$	1,0E- 6%
REAC_NODA, DZ at the point $NB8$	"ANALYTIQUE"	$10000/3$	1,0E- 6%
REAC_NODA, DZ at the point $NB17$	"ANALYTIQUE"	$-(4\times10000)/3$	1,0E- 6%
REAC_NODA, DZ at the point $NB18$	"ANALYTIQUE"	$-(4\times10000)/3$	1,0E- 6%
REAC_NODA, DZ at the point $NB19$	"ANALYTIQUE"	$-(4\times10000)/3$	1,0E- 6%

REAC_NODA, DZ at the point $NB20$	"ANALYTIQUE"	$-(4\times10000)/3$	1,0E- 6%	

to dismount the interest of the continuous formulation on the QUAD8, one tests LAGS_C besides REAC_NODA. They is the true values of pressure, we do not have more the problem of the positive NON-definite shape functions. One must thus find a pressure of $p=E(0.1/0.2)$.

8.4 Remarks

the got results are perfect. Projection occurs well. There is not convergence in generalized Newton. It is necessary to pass in partial Newton or not fixes.

9 Modelization G

9.1 Characteristic of the modelization

The modelization is 3D.
Method of contact: formulation of contact CONTINUE .

9.2 Characteristics of the mesh

Many nodes: 54
Number of meshes and types: 2 HEXA27

9.3 Quantities tested and Standard

Identification	results of reference	Value of reference	Tolerance
DEPL, DZ at point $NH1$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at point $NH2$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at point $NH3$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at point $NH4$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at point $NH9$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at point $NH10$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at point $NH11$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at point $NH21$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at point $NH12$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at point $NB5$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at point $NB6$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at point $NB7$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at point $NB8$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at point $NB17$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at point $NB18$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at point $NB19$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at point $NB20$	"ANALYTIQUE"	-0.1	1,0E- 6%
DEPL, DZ at point $NB26$	"ANALYTIQUE"	-0.1	1,0E- 6%
REAC_NODA, DZ at point $NH1$	"ANALYTIQUE"	$10000/9$	1,0E- 6%
REAC_NODA, DZ at point $NH2$	"ANALYTIQUE"	$10000/9$	1,0E- 6%
REAC_NODA, DZ at point $NH3$	"ANALYTIQUE"	$10000/9$	1,0E- 6%
REAC_NODA, DZ at point $NH4$	"ANALYTIQUE"	$10000/9$	1,0E- 6%
REAC_NODA, DZ at point $NH9$	"ANALYTIQUE"	$(4\times10000)/9$	1,0E- 6%
REAC_NODA, DZ at point $NH10$	"ANALYTIQUE"	$(4\times10000)/9$	1,0E- 6%
REAC_NODA, DZ at point $NH11$	"ANALYTIQUE"	$(4\times10000)/9$	1,0E- 6%
REAC_NODA, DZ at point $NH12$	"ANALYTIQUE"	$(4\times10000)/9$	1,0E- 6%
REAC_NODA, DZ at point $NH21$	"ANALYTIQUE"	$(16\times10000)/9$	1,0E- 6%
REAC_NODA, DZ at point $NB5$	"ANALYTIQUE"	$-10000/9$	1,0E- 6%
REAC_NODA, DZ at point $NB6$	"ANALYTIQUE"	$-10000/9$	1,0E- 6%
REAC_NODA, DZ at point $NB7$	"ANALYTIQUE"	$-10000/9$	1,0E- 6%
REAC_NODA, DZ at point $NB8$	"ANALYTIQUE"	$-10000/9$	1,0E- 6%
REAC_NODA, DZ at point $NB17$	"ANALYTIQUE"	$-(4\times10000)/9$	1,0E- 6%
REAC_NODA, DZ at point $NB18$	"ANALYTIQUE"	$-(4\times10000)/9$	1,0E- 6%
REAC_NODA, DZ at point $NB19$	"ANALYTIQUE"	$-(4\times10000)/9$	1,0E- 6%
REAC_NODA, DZ at point $NB20$	"ANALYTIQUE"	$-(4\times10000)/9$	1,0E- 6%

REAC_NODA, DZ at point $NB26$	"ANALYTIQUE"	$-(16\times10000)/9$	1,0E- 6%	

9.4 Remarks

got results are perfect. Projection occurs well. There is not convergence in generalized Newton. It is necessary to pass in partial Newton or not fixes.

10 Summary of the results

the results got on the modelizations in formulation DISCRETE (A, B, C and E) this case test are satisfactory.

On the other hand, in formulation CONTINUE (D, F and G), one does not manage to make converge the algorithm of Newton generalized on the quadratic cases (F and G). And it is necessary to reinforce the geometrical criterion for the linear case (D).