SSNV167 – Contact for the quadratic elements

Summary:

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 nonplane quadratic meshs.

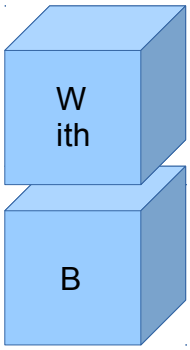
This test comprises 5 modelings:

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

1 Problem of reference

1.1 Geometry

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



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

Cubic	Not	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 materials

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

1.3 Boundary conditions and loadings

A displacement is imposed $DZ=-0.2\text{mm}$ 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 deformation homogeneous according to z (null Poisson's ratio). The force is thus distributed according to the values of the functions of form on the nodes of the interface.

2.2 Sizes 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	Not	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 cube A, one must find (for QUAD8) :

Cubic	Not	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 QUAD 9) :

Cubic	Not	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 the 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 Modeling A

3.1 Characteristics of modeling

Modeling is 3D.
Method of contact: formulation of contact DISCRETE , algorithm of the active constraints, with REAC_GEOM=' CONTRÔLE'.

3.2 Characteristics of the grid

Many nodes: 8
Many meshs and types: 2 HEXA8

3.3 Sizes tested and results

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

3.4 Remarks

The got results are perfect. Projection occurs well.

4 Modeling B

4.1 Characteristics of modeling

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

4.2 Characteristics of the grid

Many nodes: 40
Many meshs and types: 2 HEXWith20

4.3 Sizes tested and results

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

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

4.4 Remarks

The got results are perfect. Projection occurs well. Positive not-definite functions of form of QUAD8 we gives results which “oscillate”, which is false from the mechanical point of view, but in conformity with the approximation.

5 Modeling C

5.1 Characteristics of modeling

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

5.2 Characteristics of the grid

Many nodes: 54
Many meshs and types: 2 HEXWith27

5.3 Sizes tested and results

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

REAC_NODA, DZ at the point $NB17$	'ANALYTICAL'	$-(4\times10000)/9$	1,0E- 6%
REAC_NODA, DZ at the point $NB18$	'ANALYTICAL'	$-(4\times10000)/9$	1,0E- 6%
REAC_NODA, DZ at the point $NB19$	'ANALYTICAL'	$-(4\times10000)/9$	1,0E- 6%
REAC_NODA, DZ at the point $NB20$	'ANALYTICAL'	$-(4\times10000)/9$	1,0E- 6%
REAC_NODA, DZ at the point $NB26$	'ANALYTICAL'	$-(16\times10000)/9$	1,0E- 6%

5.4 Remarks

The got results are perfect. Projection occurs well.

6 Modeling D

6.1 Characteristics of modeling

Modeling is 3D.
Method of contact: formulation of contact CONTINUOUS .

6.2 Characteristics of the grid

Many nodes: 8
Many meshs and types: 2 HEXA8

6.3 Sizes tested and results

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

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

6.4 Remarks

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

7 Modeling E

7.1 Characteristics of modeling

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

7.2 Characteristics of the grid

Many nodes: 8
Many meshs and types: 2 HEXA8

7.3 Sizes tested and results

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

7.4 Remarks

The got results are perfect. Projection occurs well.

8 Modeling F

8.1 Characteristics of modeling

Modeling is 3D.
Method of contact: Method of contact: formulation of contact CONTINUOUS .

8.2 Characteristics of the grid

Many nodes: 40
Many meshs and types: 2 HEXA20

8.3 Sizes tested and results

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

REAC_NODA, DZ at the point $NB20$	'ANALYTICAL'	$-(4\times10000)/3$	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 not-definite functions of form. 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 Modeling G

9.1 Characteristics of modeling

Modeling is 3D.
Method of contact: formulation of contact CONTINUOUS .

9.2 Characteristics of the grid

Many nodes: 54
Many meshs and types: 2 HEXA27

9.3 Sizes tested and results

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

REAC_NODA, DZ at the point $NB17$	'ANALYTICAL'	$-(4\times10000)/9$	1,0E- 6%
REAC_NODA, DZ at the point $NB18$	'ANALYTICAL'	$-(4\times10000)/9$	1,0E- 6%
REAC_NODA, DZ at the point $NB19$	'ANALYTICAL'	$-(4\times10000)/9$	1,0E- 6%
REAC_NODA, DZ at the point $NB20$	'ANALYTICAL'	$-(4\times10000)/9$	1,0E- 6%
REAC_NODA, DZ at the point $NB26$	'ANALYTICAL'	$-(16\times10000)/9$	1,0E- 6%

9.4 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.

10 Summary of the results

Results got on modelings in formulation DISCRETE (A, B, C and E) this case test is satisfactory.

On the other hand, in formulation CONTINUOUS (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).