

## SSLS200 - Linear mechanics modelizations of shell

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### Summarized:

This test is a test of NON-regression. It does not have an analytical solution. The purpose is to test a large number of different elementary computations:

- tally: linear mechanics (MECA\_STATIQUE)
- very varied loadings (in form "reality" or "function")
- all types of meshes possible

Modelization *A* :

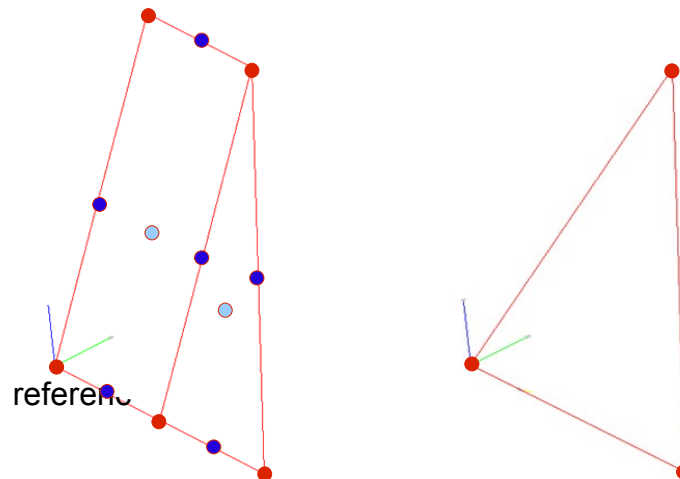
- Modelization DKT Q4G DST COQUE\_3D

## 1 Problem of

### N1N2N3N5N6Q1Q2Q3Q9T2T7N1N3N5T1T3T4XYZXYZN7N8N9N10N12N11

### Géométrie

#### 1.1



Coordinated of the nodes:

	N1	N2	N3	N5	N6	N7	N8	N9	N10	N11	N12
x	0.	1.	2.	1.	0.	0.5	1.	0.5	0.	1.5.	1.
y	0.	0.	0.	1.	1.	0.	0.5	1.	0.5.	0.	0.
z	0.	0.	0.	2.	2.	0.	1.	2.	1.	1.	0.

Thickness = 0.7

#### 1.2 Material properties

- Modulus Young

		Temperature	
		-1000 °	1000 °
E	-1200	1200	

- Poisson's ratio:  $\nu=0.3$
- thermal Mass  $\rho=8.1$
- volumiqueformule Coefficient of thermal expansion:

		Temperature	
		-1000 °	1000 °

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$\alpha$	-1200	1200
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- Temperature of definition of the thermal coefficient of thermal expansion: 1.5°

## 1.3 Boundary conditions and loadings

Boundary conditions:

- Node  $N1$  :  $DX=1$  ;  $DY=2$  ;  $DZ=3$  ;  $DRX=1$  ;  $DRY=2$  ;  $DRZ=3$
- Node  $N6$  :  $DX=2$  ;  $DY=3$  ;  $DZ=4$  ;  $DRX=1$  ;  $DRY=2$  ;  $DRZ=5$

Loadings

PESANTEUR	$g=9,8$ According to direction (0.3;0.1;-0.4)	
FORCE_ARETE	Forces linear	$FZ=8$
FORCE_COQUE	Charges distributed	$F1=5.$ $F2=8.$ $F3=9.$ $MF1=5.$
formula	FORCE_COQUE Pressure	$PRES=5.$

Temperature

- Temperature on the higher skin of the shell:  $TEMP\_SUP=24^\circ$
- Temperature on the average skin of the shell:  $TEMP=18^\circ$
- Temperature on the lower skin of the shell:  $TEMP\_INF=12^\circ$
- Reference temperature =  $1.5^\circ$

## 2 Reference solution

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### 2.1 Method of calculating used for the reference solution

the reference solution corresponds to a solution of NON-regression

### 2.2 Results of reference

One tests the sum of the absolute values of the components:

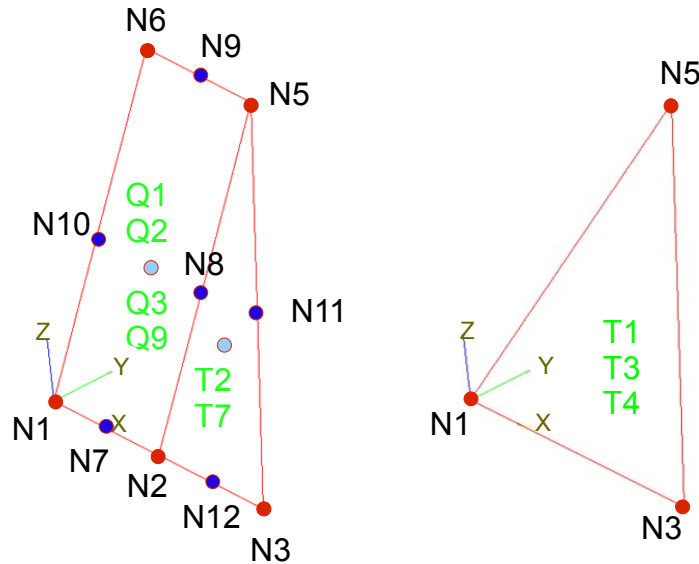
- Fields:  
DEPL  
EFGE\_ELNO  
EPSI\_ELGA  
EPSI\_ELNO  
EPSI\_NOEU  
SIEF\_ELGA  
SIGM\_ELNO  
DEGE\_ELNO  
DEGE\_ELGA
- Of potential energy ENER\_POT :  
TOTALEPOUR\_CENT
- Of the mass and inertia MASS\_INER :  
MASSE  
CDG\_X  
CDG\_Y  
CDG\_Z  
IX\_G  
IY\_G  
IZ\_G  
IXY\_G  
IXZ\_G  
IYZ\_G  
IX\_PRIN\_G  
IY\_PRIN\_G  
IZ\_PRIN\_G  
ALPHA  
BETA  
GAMMA

### 2.3 Uncertainty on the solution

numerical Solution

## 3 Modelization A

### 3.1 Characteristic of the modelization



Mesh	Modelization
Q1	DKT
T1	DKT
T2	DKT
Q2	Q4G
T4	Q4G
Q3	DST
T3	DST
Q9	COQUE_3D
T7	COQUE_3D

### 3.2 Characteristics of the mesh

Many nodes: 14

Number of meshes and types: 9 ( 4 TRIA3, 1 TRIA7, 3 QUAD4, 1 QUAD9)

## 3.3 Quantities tested and results

Standard	Quantity	Identification of reference	Values of reference
DEPL	SOMM_ABS	"NON_REGRESSION"	44977.374738
EFGE_ELNO	SOMM_ABS	"NON_REGRESSION"	1.837595E+05
EPSI_ELGA	SOMM_ABS	"NON_REGRESSION"	85388.64440
EPSI_ELNO	SOMM_ABS	"NON_REGRESSION"	31611.626917
EPSI_NOEU	SOMM_ABS	"NON_REGRESSION"	9400.462073
SIEF_ELGA	SOMM_ABS	"NON_REGRESSION"	1.366574E+06
SIGM_ELNO	SOMM_ABS	"NON_REGRESSION"	1.597725E+06
DEGE_ELNO	SOMM_ABS	"NON_REGRESSION"	53984.851273
DEGE_ELGA	SOMM_ABS	"NON_REGRESSION"	48101.597890

Standard	Component	Quantity of Standard	test of reference	TOTAL Values of reference
		NUME_ORDR E	SOMM_ABS "NON_REGRESSION"	"
	6	INSTS	SOMM_ABS "NON_REGRESSION"	"
	0.0	SOMM_ABS	"NON_REGRESSION"	3.172095E+07
	POUR_CENT	SOMM_ABS	"NON_REGRESSION"	100.0
MASS_INER	MASSE	SOMM_ABS	"NON_REGRESSION"	101.428043
	CDG_X	SOMM_ABS	"NON_REGRESSION"	0.791667
	CDG_Y	SOMM_ABS	"NON_REGRESSION"	0.4166667
	CDG_Z	SOMM_ABS	"NON_REGRESSION"	0.833333
	IX_G	SOMM_ABS	"NON_REGRESSION"	42.881522
	IY_G	SOMM_ABS	"NON_REGRESSION"	52.774983
	IZ_G	SOMM_ABS	"NON_REGRESSION"	32.016044
	IXY_G	SOMM_ABS	"NON_REGRESSION"	2.817446
	IXZ_G	SOMM_ABS	"NON_REGRESSION"	5.634891
	IYZ_G	SOMM_ABS	"NON_REGRESSION"	13.839293
	IX_PRIN_G	SOMM_ABS	"NON_REGRESSION"	23.090901
	IY_PRIN_G	SOMM_ABS	"NON_REGRESSION"	44.887018
	IZ_PRIN_G	SOMM_ABS	"NON_REGRESSION"	59.694630
	ALPHA	SOMM_ABS	"NON_REGRESSION"	125.443769
	BETA	SOMM_ABS	"NON_REGRESSION"	58.461140
	GAMMA	SOMM_ABS	"NON_REGRESSION"	148.756141

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