
SDLS501 - Free vibrations of a corrugated iron

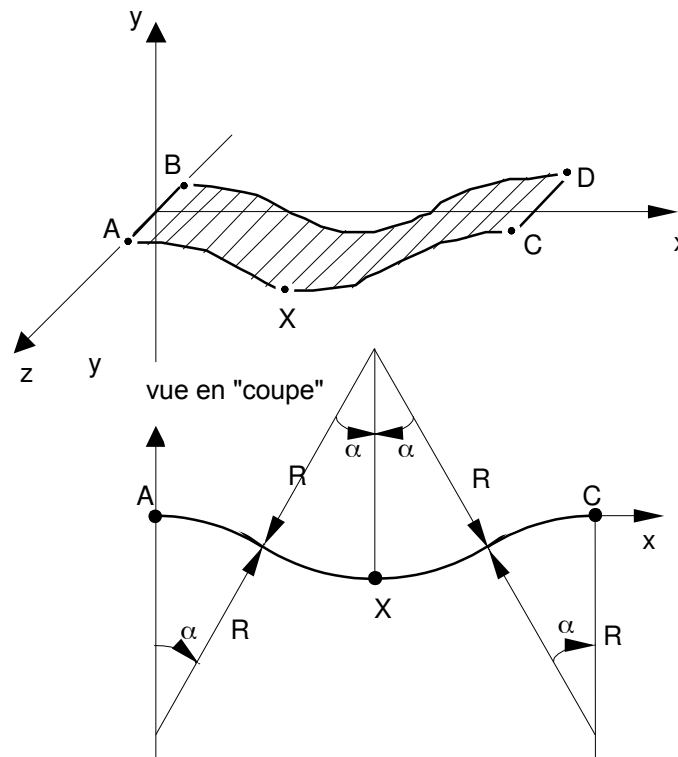
Summary:

This test represents a calculation in dynamic modal analysis of a corrugated iron into free-free. It allows to validate modeling finite elements DKT. on a nonplane plate modelled in quadrangles.

Frequencies obtainedES are comparedES with a reference solution obtained with *Code_Aster* starting from a modeling HULL_3D. The test makes it possible to measure the impact of the not-flatness of elements DKT on the results.

1 Problem of reference

1.1 Geometry



Characteristics of the hull:

- thickness $H = 0.05\text{m}$,
- radius of curvature $R = 1\text{m}$,
- width = $AB = CD = 0.1\text{m}$,
- the angle α is selected so that surface **higher** hull as in point X with (there = 0), i.e. is aligned with A and C.

$$\cos \alpha = 1 - \frac{1}{4} \frac{h}{R}$$

1.2 Properties of material

The properties of material constituting the plate are:

$E = 2.E+11 \text{ Pa}$	Young modulus
$\nu = 0.3$	Poisson's ratio
$\rho = 7800. \text{ Kg/m}^3$	Density

1.3 Boundary conditions and loadings

No boundary condition: dynamic analysis into free-free

1.4 Initial conditions

Without object

2 Reference solution

2.1 Method of calculating used for the reference solution

Modeling A (COQUE_3D) is used as reference for modeling DKT in quadrangles.

2.2 Results of reference

The first three nonworthless Eigen frequencies.

Frequency mode	628.35 Hz
7:	
Frequency mode	693.21 Hz
8:	
Frequency mode	1672.83 Hz
9:	

2.3 Uncertainties on the solution

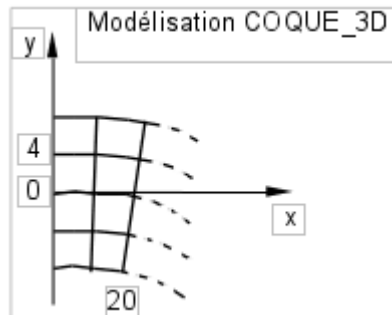
- not regression for modeling A
- about 10 % for modeling B

2.4 Bibliographical references

None.

3 Modeling A

3.1 Characteristics of modeling



3.2 Characteristics of the grid

Many nodes: 369

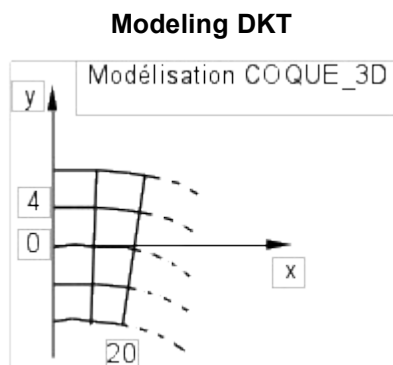
Many meshes and types: 80 QUAD9

3.3 Sizes tested and results

Identification	Moments	Reference	Aster	% difference
Frequency mode 7		628.35	628.35	0.
Frequency mode 8		693.21	693.21	0.
Frequency mode 9		1672.83	1672.83	0.

4 Modeling B

4.1 Characteristics of modeling



4.2 Characteristics of the grid

Many nodes: 105

Many meshes and types: 80 QUAD4

4.3 Sizes tested and results

Identification	Moments	Reference	Aster	% difference
Frequency mode 7		628.35	680.72	8.33
Frequency mode 8		693.21	764.68	10.31
Frequency mode 9		1672.83	1789.21	6.96

5 Summary of the results

This CAS-test made it possible to test modeling DKT on a nonplane plate (corrugated iron). Compared got results with a solution resulting from a modeling COQUE_3D show, in addition to the error due to the less rich interpolation of the DKT compared to COQUE_3D, the error due to the not-flatness of elements DKT quadrangles. This one is about 10 % on the frequencies.