

SSNV193 – Contact with static macronutrients

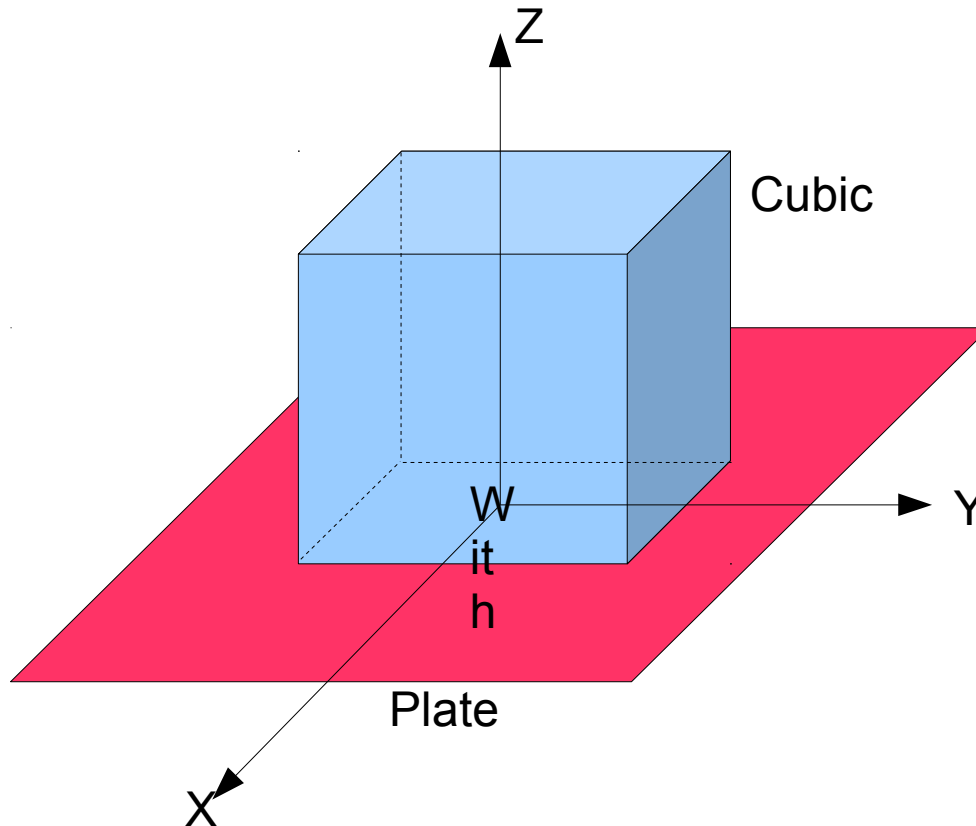
Summary:

The objective of this test is to validate the use of static macronutrients with the unilateral contact in formulation CONTINUOUS and DISCRETE.

1 Problem of reference

1.1 Geometry

One considers a cube of with dimensions 1 m posed on a rigid level.



1.2 Properties of material

The material is elastic isotropic whose properties are:

- $E = 209\,000\text{ MPa}$
- $\nu = 0.3$

1.3 Boundary conditions and loadings

On the higher face, one imposes a vertical displacement of -0.1 m . The rigid plan is embedded and one imposes a unilateral condition of contact between the cube and the rigid plan.

2 Reference solution

2.1 Method of calculating

Calculation is a calculation of not-regression between various situations. Reference is calculated without static macronutrient.

2.2 Sizes and results of reference

One tests displacement on the lower face of the cube, with the medium and the reaction of contact. Vertical displacement is necessarily null (cubic initially in contact, rigid plan)

2.3 Uncertainties on the solution

Displacement is an analytical solution.

3 Modeling A

3.1 Characteristics of modeling

A modeling is used 3D.

3.2 Characteristics of the grid

The grid contains 1128 elements of the type HEXA8.

- The first calculation is done with the contact in formulation CONTINUOUS and without macronutrient;
- The second calculation is done with the contact in formulation CONTINUOUS and the cube is represented by a macronutrient;
- The third calculation is done with the contact in formulation DISCRETE and the cube is represented by a macronutrient;

3.3 Sizes tested and results

One tests displacement and the vertical reaction at the point A .

The first calculation (without macronutrient) – Contact in formulation CONTINUOUS – Reference

Identification	Type of reference	Value of reference	Tolerance
Not A - DZ	'ANALYTICAL'	0	1,00E-012
Not A - RZ	'NON_REGRESSION'	-1,380156E+009	1,00E-006

The second calculation (with macronutrient) – Contact in formulation CONTINUOUS

Identification	Type of reference	Value of reference	Tolerance
Not A - DZ	'ANALYTICAL'	0	1,00E-012
Not A - RZ	'AUTRE_ASTER'	-1,380156E+009	1,00E-006

The third calculation (with macronutrient) – Contact in formulation DISCRETE

Identification	Type of reference	Value of reference	Tolerance
Not A - DZ	'ANALYTICAL'	0	1,00E-012
Not A - RZ	'AUTRE_ASTER'	-1,380156E+009	1,00E-006

3.4 Remarks

Three calculations give the same results exactly.

4 Summary of the results

This CAS-test shows the possibility of using static macronutrients to represent the rigidity of a structure subjected to a unilateral contact, and this, some is the formulation of the latter (continuous or discrete). There is no restriction on the conditions of use, potential surfaces of contact can belong to the macronutrients. The model comparison complete/static macronutrients shows as the results are identical, as well in displacement as in force.