

## SDLV402 - Under-structuring dynamic: incompatible grid and mode

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### Summary:

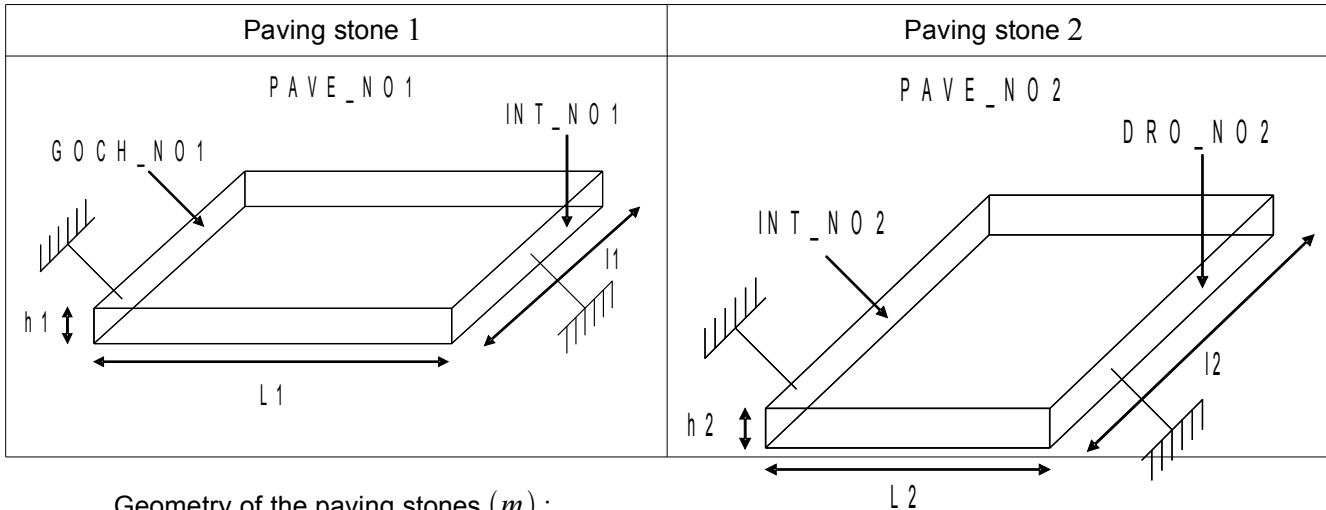
The objective of this case test is to calculate the Eigen frequencies of two coupled paving stones. Accordingly, the dynamic features of incompatibility of grid under-structuring are tested, as well as the coupling by mode of interface.

The case test is composed of a modeling 3D , of each paving stone.

## 1 Problem of reference

### 1.1 Geometry

Geometry of the substructures:



Geometry of the paving stones (m) :

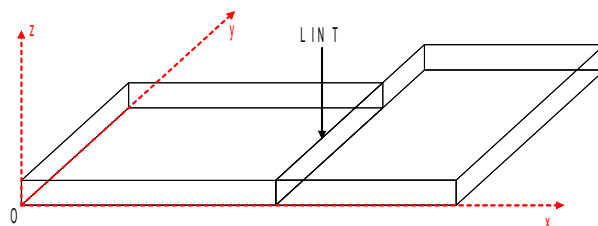
$L1 = 1$	$L2 = 0.5$
$l1 = 0.5$	$l2 = 0.7$
$h1 = 0.2$	$h2 = 0.2$

Group of meshes:

**PAVE\_NO1** : together meshes of the paving stone 1  
**GOCH\_NO1** : together meshes forming the face of left of the paving stone 1  
**INT\_NO1** : together meshes forming the face of right-hand side of the paving stone 1

**PAVE\_NO2** : together meshes of the paving stone 2  
**INT\_NO2** : together meshes forming the face of left of the paving stone 2  
**DRO\_NO2** : together meshes forming the face of right-hand side of the paving stone 2

Geometry of the structure:



Group of meshes:

**LINT** : formed interface by the groups of meshes **INT\_NO1** and **INT\_NO2**

## 1.2 Elastic properties of materials

- Paving stone 1 :
  - $E = 7.1E10 Pa$  Young modulus
  - $\nu = 0.3$  Poisson's ratio
  - $\rho = 2700.0 kg.m^{-3}$  Density
- Paving stone 2 :
  - $E = 12.0E10 Pa$  Young modulus
  - $\nu = 0.3$  Poisson's ratio
  - $\rho = 7820.0 kg.m^{-3}$  Density

## 1.3 Boundary conditions and loadings

- Paved imposed displacement 1 :
  - $GOCH\_NO1$  and  $INT\_NO1$  :  $DX = DY = DZ = 0.0$
- Paved imposed displacement 2 :
  - $DRO\_NO2$  and  $INT\_NO2$  :  $DX = DY = DZ = 0.0$
- Interface paved 1 :
  - $INT\_NO1$  : Interface of the type *CRAIGB*
- Interface paved 2 :
  - $INT\_NO2$  : Interface of the type *CRAIGB*

## 2 Reference solution

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### 2.1 Calculation of reference

A reference is used AUTRE\_ ASTER to test the frequencies.

Course of the case test:

- Definition and calculation of the static modal base of each paving stone starting from their model
- Creation of a static model generalized by coupling of the bases and models of the paving stones
- Calculation and restitution of the modes of interface on the paving stones
- Definition and calculation of the modal base of each paving stone by including the interfaces modes
- Creation of a model generalized by coupling of the bases and models of the paving stones
- Calculation of the clean modes
- Restitution on the basis of physical clean mode

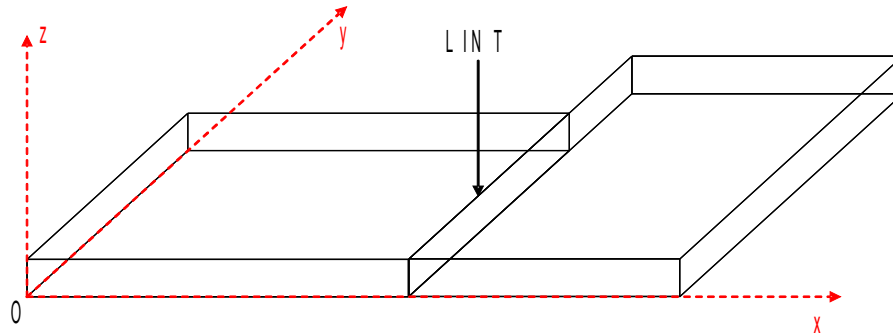
### 2.2 Sizes and results of reference

- *FREQ* : frequency

Component	$N^{\circ}$ mode	Reference (Hz)
<i>FREQ</i>	1	430.852
	2	707.717
	3	808.549
	4	930.199
	5	1193.94

## 3 Modeling A

### 3.1 Characteristics of modeling



Modeling paved 1 3D :

Many nodes	515	
Many meshes	100	That is to say:
		QUAD8 20
		HEXA20 80

Modeling paved 2 3D :

Many nodes	620	
Many meshes	120	That is to say:
		QUAD8 20
		HEXA20 100

### 3.2 Sizes tested and results

Component	N° mode	Reference (Hz)	Tolerance (%)
<i>FREQ</i>	1	430.852	1.0
	2	707.717	1.0
	3	808.549	1.0
	4	930.199	4.0
	5	1193.94	5.0

## 4 Summary of the results

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The got results are satisfactory.