

SSNV189 - Validation of the law ELAS_HYPER on a strip

Summary:

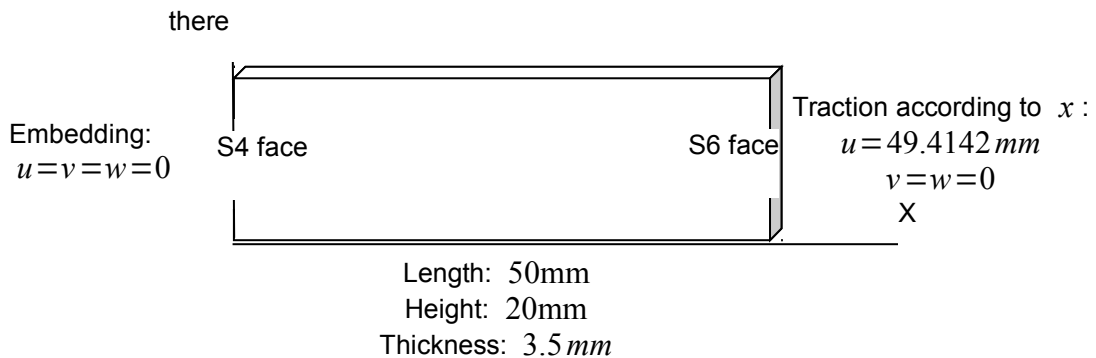
This test makes it possible to validate the behavior very elastic of type Signorini (material ELAS_HYPER) on a CAS-test carrying out an extension of a strip, by comparison with ANSYS.

1 Problem of reference

1.1 Geometry, boundary conditions and loadings

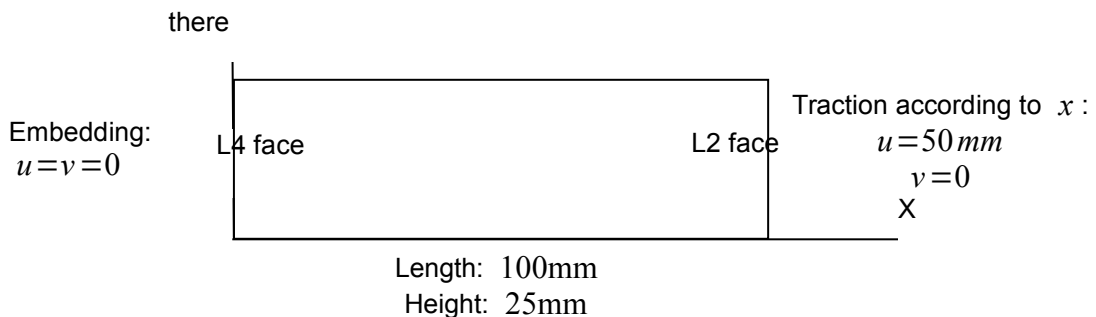
Model 3D

A strip of dimensions is considered $50 \times 20 \times 3.5 \text{ mm}$. It is embedded on left surface ($S4$) and one imposes a displacement of 49.4142 mm according to x on the right face ($S6$).



Model plan (plane constraints and plane deformations)

A strip of dimensions is considered $100 \times 25 \text{ mm}$. It is embedded on left surface ($L4$) and one imposes a displacement of 50 mm according to x on the right face ($L2$).



The loading is increasing, in 20 increments.

1.2 Properties of materials

One tests in very elasticity of the Signorini type.

Behavior ELAS_HYPER	Signorini
$C10$	2.668 MPa
$C01$	0.271 MPa
$C20$	0.446 MPa
K	2939

2 Reference solution

The reference solution comes from code ANSYS. One compares the force with embedding.

- Model 3D : element *SOLID185* (mixed formulation in displacement and pressure)
- Model plane deformations: element *PLANE182* (mixed formulation in displacement and pressure)
- Model forced plane: element *PLANE182* (mixed formulation in displacement and pressure)

3 Modeling A

3.1 Characteristics of modeling

It is modeling 3D with under-integrated elements of the strip: 3D_SI.

3.2 Characteristics of the grid

- Many elements: 90 HEXA20.
- Many nodes: 739

3.3 Sizes tested and results

Identification	Reference	Type of reference	Tolerance
Force with embedding	1180.67 N	'SOURCE_EXTERNE'	1.0%

4 Modeling B

4.1 Characteristics of modeling

It is modeling 2D in plane deformations of the strip: D_PLAN.

4.2 Characteristics of the grid

- Many elements: 900 QUAD8.
- Many nodes: 2851

4.3 Sizes tested and results

Identification	Reference	Type of reference	Tolerance
Force with embedding	229.336 N	'SOURCE_EXTERNE'	0.1%

5 Modeling C

5.1 Characteristics of modeling

It is modeling 2D in plane constraints of the strip: C_PLAN.

5.2 Characteristics of the grid

- Many elements: 900 QUAD8.
- Many nodes: 2851

5.3 Sizes tested and results

Identification	Reference	Type of reference	Tolerance
Force with embedding	181.327 N	'SOURCE_EXTERNE'	0.1%

6 Summary of the results

The got results are in excellent agreement with the reference solution, given by ANSYS.