

SSNV189 - Validation of model ELAS_HYPER on a strip

Summarized:

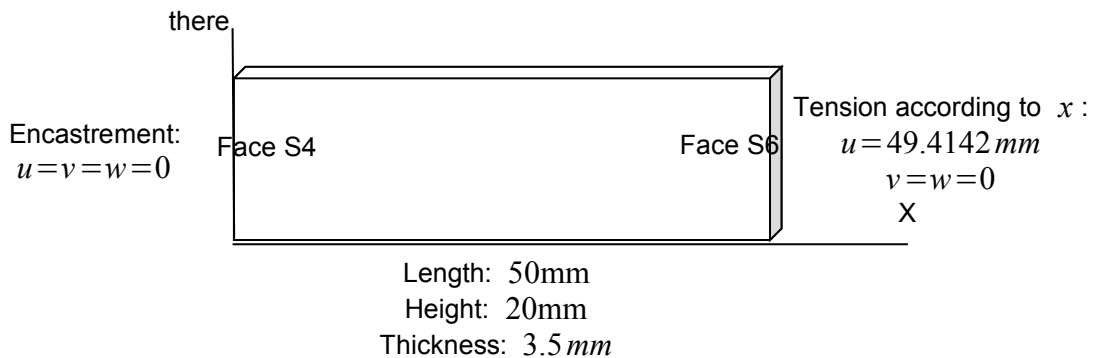
This test makes it possible to validate the elastic behavior hyper of type Signorini (material ELAS_HYPER) on a benchmark carrying out an extension of a strip, by comparison with ANSYS.

1 Problem of reference

1.1 Geometry, boundary conditions and loadings

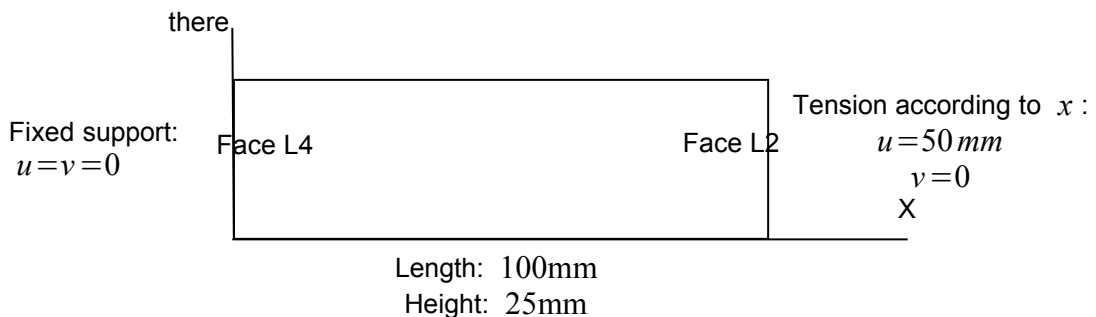
Models 3D

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



Model plane (plane stresses and plane strains)

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



The loading is increasing, in 20 increments.

1.2 Properties of the 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 the fixed support.

- Model 3D : element *SOLID185* (mixed formulation in displacement and pressure)
- Models plane strains: element *PLANE182* (mixed formulation in displacement and pressure)
- Models plane stresses: element *PLANE182* (mixed formulation in displacement and pressure)

3 Modelization A

3.1 Characteristic of the modelization

It acts of the modelization 3D with under-integrated elements of the strip: 3D_SI.

3.2 Characteristics of the mesh

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

3.3 Quantities tested and results

Standard	Identification	Reference of reference	Tolerance
Forces with fixed support	1180.67 N	"SOURCE_EXTERNE"	1,0%

4 Modelization B

4.1 Characteristic of the modelization

It acts of the modelization 2D in plane strains of the strip: D_PLAN.

4.2 Characteristics of the mesh

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

4.3 Quantities tested and results

Standard	Identification	Reference of reference	Tolerance
Forces with fixed support	229.336 N	"SOURCE_EXTERNE"	0.1%

5 Modelization C

5.1 Characteristic of the modelization

It acts of the modelization 2D in plane stresses of the strip: C_PLAN.

5.2 Characteristics of the mesh

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

5.3 Quantities tested and results

Standard	Identification	Reference of reference	Tolerance
Forces with fixed support	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.