
SSL116 - Truss 3D reinforced

Summarized:

This test relates to the study of a truss made up of hurred beams, in linear static analysis.

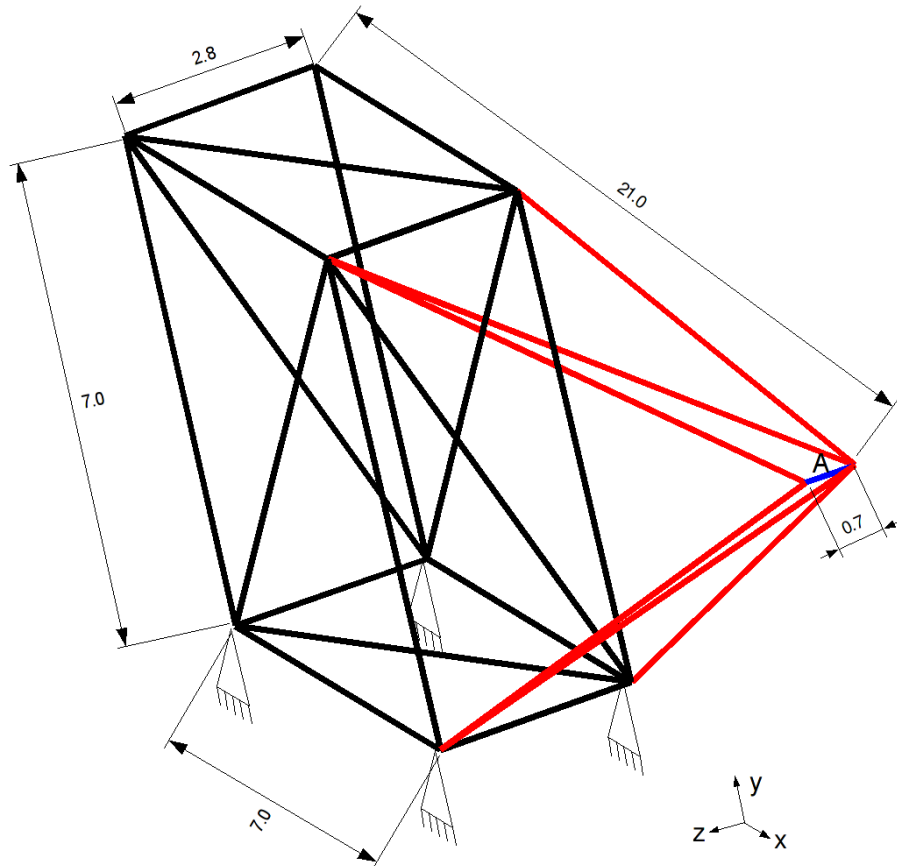
The truss is modelled with elements linear (SEG2) and subjected to a specific loading and the effect of gravity.

There is a modelization with a first geometry, then a modelization with bars of reinforcement.

This test is an example with didactic aiming since it rather shows the construction of the solution by finite elements than to use MECA_STATIQUE directly.

1 Problem of reference

1.1 Geometry



the truss consists of beams of sections:

- for the —, annular $R=0.05$, $ep=0.02$
- for the —, circular $R=0.05$
- for the —, circular $R=0.07$

the point A is in the middle of the final rod.

1.2 Material properties

isotropic linear elastic Material:
 $E=1.962 E11 Pa$; $\nu=0.3$

1.3 Boundary conditions and loadings

the base of the truss is clamped.

Loadings

Forces nodal vertical in A : $F_y = -20E6 N$
Field of gravity (according to x) $g = -9.81 m/s^2$

2 Reference solution

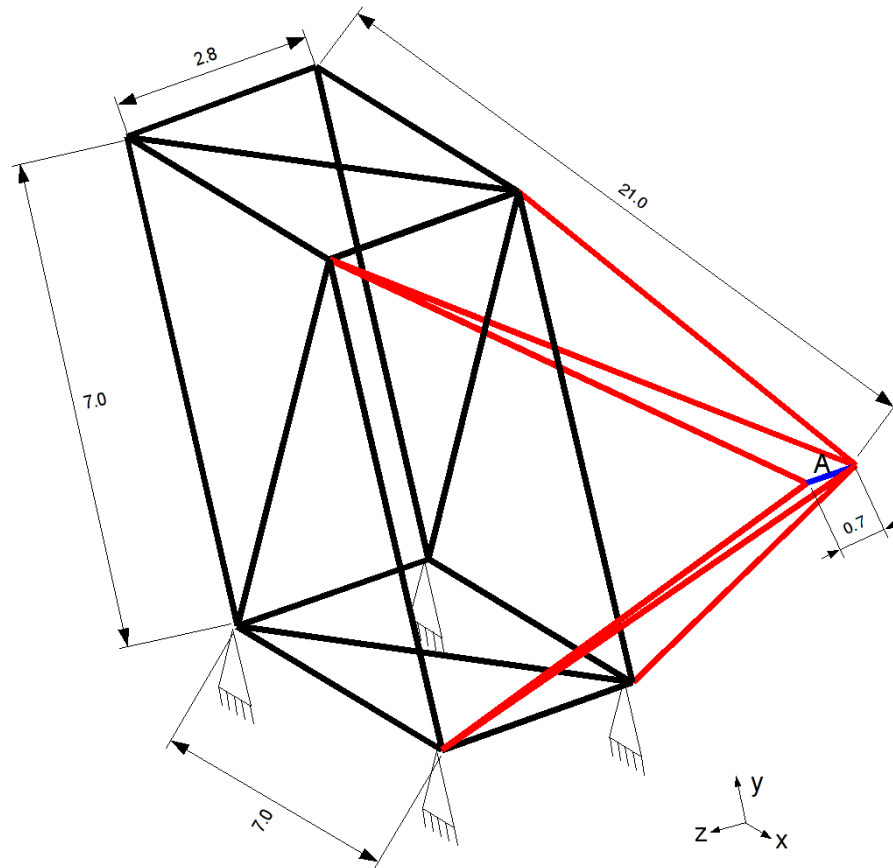
2.1 Results of reference

displacements and rotations of node A (DEPL).

The results calculated in this case test result from a former execution of Aster. It is a case test of non regression.

3 Modelization A

3.1 Characteristic of the modelization



- Modelization POU_D_T
- No the reinforcements

3.2 Characteristic of the mesh

The mesh is obtained by GMSH.

Many nodes: 247

Number of meshes: 267

3.3 Quantities tested and results

Loading	Value tested	Aster
vertical Concentrated force in <i>A</i>	Displacement in <i>A</i> <i>Dx</i>	7.20564E-01
	Displacement in <i>A</i> <i>Dy</i>	-2.02277
	Displacement in <i>A</i> <i>Dz</i>	-1.12417
	Rotation in <i>A</i> <i>Drx</i>	9.88004E-01
	Rotation in <i>A</i> <i>Dry</i>	1.83637E-01
	Rotation in <i>A</i> <i>Drz</i>	-1.12592E-01

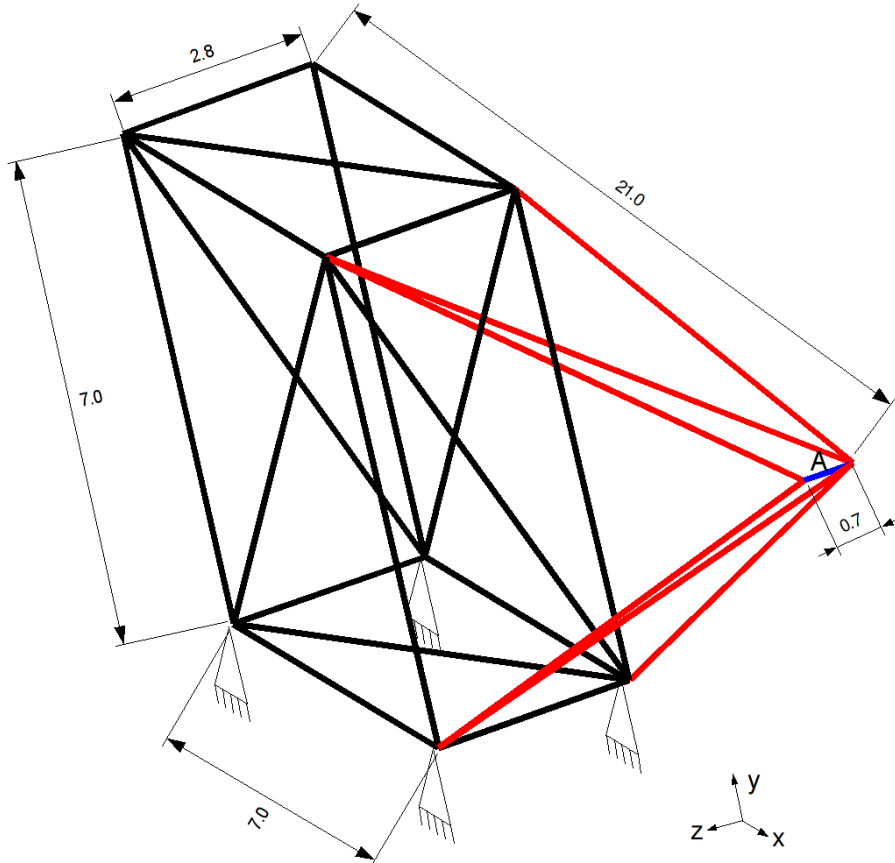
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3.4 Remarks

One sees that the NON-symmetry of the deflection of the truss involves displacements according to z , although the applied force is it according to Y and X only (force of gravity)

4 Modelization B

4.1 Characteristic of the modelization



- Modelization POU_D_T
- Bars of reinforcement

4.2 Characteristic of the mesh

The mesh is obtained by **GMSH**.

Many nodes: 265

Number of meshes: 287

4.3 Quantities tested and results

Loading	Value tested	Aster
vertical Concentrated force in A	Displacement in A D_x	6.61627E-01
	Displacement in A D_y	-1.82145
	Displacement in A D_z	-2.6628E-01
	Rotation in A Dr_x	8.48048E-01
	Rotation in A Dr_y	1.68397E-01
	Rotation in A Dr_z	-9.43511E-02

4.4 Remarks

the reinforcements made it possible to decrease displacements of the deflection of the truss.

5 Summary of the results

This example shows a way and of the carrying out the “didactic” computation of way by explicitly building the vectors matrixes necessary for a standard computation by finite elements.