

Ramseries - Validation Case 3

Membrane under constant pressure



RamSeries

Version
15.1.0

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1 Validation Case 3 - Membrane under constant pressure

Model Description

This test case deals with the simulation of the deformation of an initially flat, circular membrane with fixed edges and loaded with a constant pressure.

Geometry

Circular membrane of radius 0.1425 m.

Domain

Incremental load analysis. Linear materials. Non-linear geometry.

Material properties

Linear elastic membrane:

- Young modulus (E): 2.0766e11 Pa
- Poisson coeff. (ν): 0.34
- Membrane thickness (t): 1.5e-6 m

Boundary Conditions

The edges of the membrane are fixed in all directions.

Load conditions

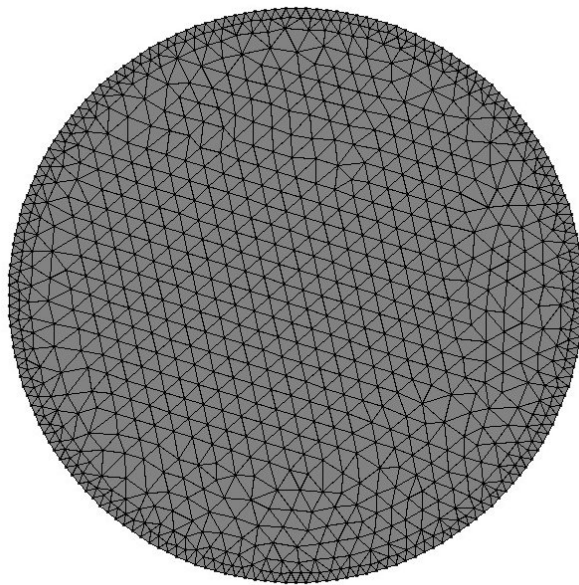
A constant pressure $P = 1.0E5$ Pa is applied to the membrane.

Solver parameters

10 load increments with a full Newton-Raphson iteration method with load control.

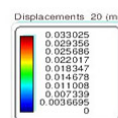
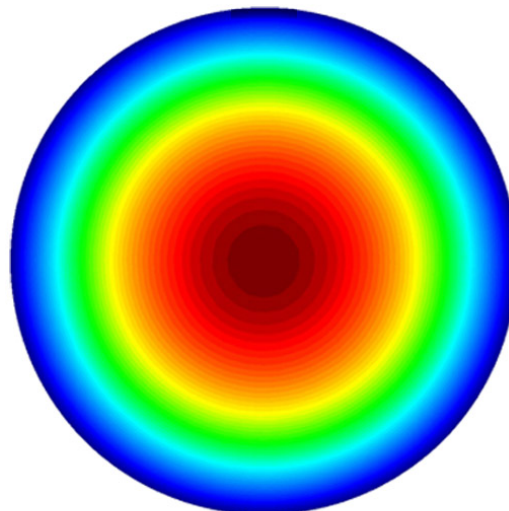
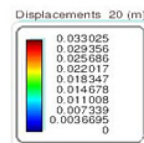
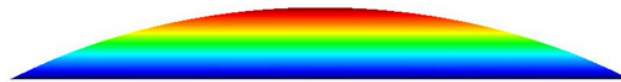
Mesh

A rough mesh was simply generated by imposing a maximum element size about 0.01 and using a mesh size transition of 0.4. The resulting mesh consists of 1000 nodes and 1822 3-noded triangular elements.



Results

For this test case, validation results simply consists on comparing the maximum displacement value obtained at the center of the membrane. Results from the present analysis show a maximum displacement about 0.033025 m which is in good agreement to the value 0.0331 m reported in Reference [2].



Validation Summary

CompassFEM version	15.1.0
Tdyn solver version	15.1.0
RamSeries solver version	15.1.0
Benchmark status	Successfull
Last validation date	27/11/2018

References

- [1] I.Ortigosa. Development of a decision support system for the design and adjustment of sailboat rigging. PhD.Thesis 2011.
- [2] R.M.Pauletti, D.Mariani Guninardi and C.Deifeld. Argyris natural membrane finite element revisited. Structural Membranes CIMNE 2005.