LE9: Axisymmetric branched shell under pressure

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This problem provides evidence that Abaqus can reproduce the result from the benchmark defined by NAFEMS and cited as the reference solution.

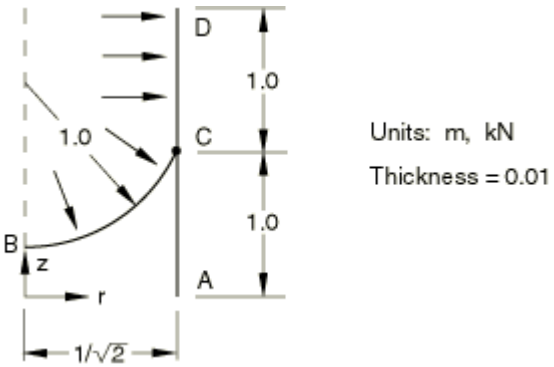
This page discusses:

ProductsAbaqus/Standard

Elements tested

SAX2

Problem description



Mesh:

A coarse and a fine mesh are tested.

Material:

Linear elastic, Young's modulus = 210 GPa, Poisson's ratio = 0.3.

Boundary conditions:

ur=uz=ϕ=0 at point A.

Loading:

Uniform internal pressure of 1.0 MPa along edge BCD.

General:

Gauss integration is used for the shell cross-section in input file nle9xa3f.inp.

Reference solution

This is a test recommended by the National Agency for Finite Element Methods and Standards (U.K.): Test LE9 from NAFEMS Publication TNSB, Rev. 3, “The Standard NAFEMS Benchmarks,” October 1990.

Target solution: Axial stress, σzz = −319.9 MPa on the outer surface of the upper cylinder at point C.

Results and discussion

The results are shown in the following table. The values enclosed in parentheses are percentage differences with respect to the reference solution.

Element	σzz, Coarse Mesh	σzz, Fine Mesh
SAX2	−307.24 MPa (−4.0%)	−314.81 MPa (−1.6%)

Input files

nle9xa3c.inp

Coarse mesh analysis.

nle9xa3f.inp

Fine mesh analysis.