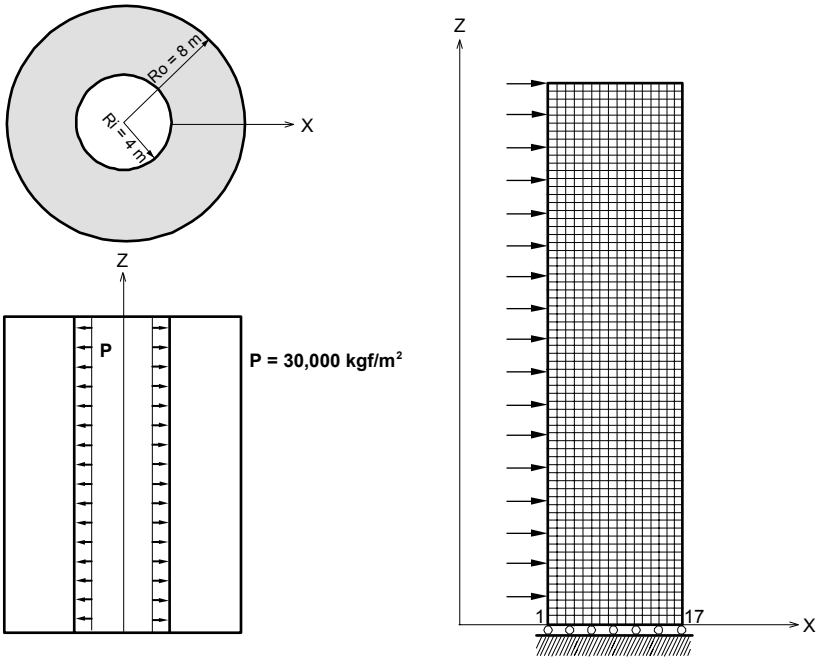
Static-39

Title

Long thick-walled cylinder subjected to internal pressure load

Description

A long thick-walled cylinder is subjected to the internal pressure
Determine the radial displacement and radial stress at the inner surface at the middle wall thickness.



Structural geometry and analysis model

MODEL

Analysis Type

3-D static analysis

Unit System

m, kgf

Dimension

Inner radius 4 m Outer radius 8 m

Element

Axisymmetric element

Material

Modulus of elasticity $E = 3.0 \times 10^7$ kgf/m^2
Poisson's ratio $\nu = 0.3$

Sectional Property

Circular cross section: inner radius = 4 m, outer radius = 8 m

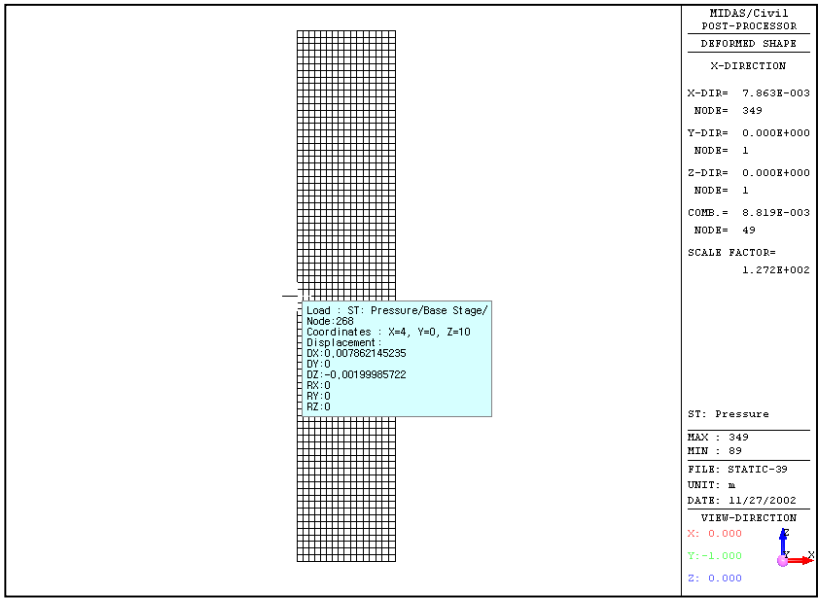
Boundary Condition

Node 1, 9, 90to96, 455, 460to484by4: Constrain D_Z

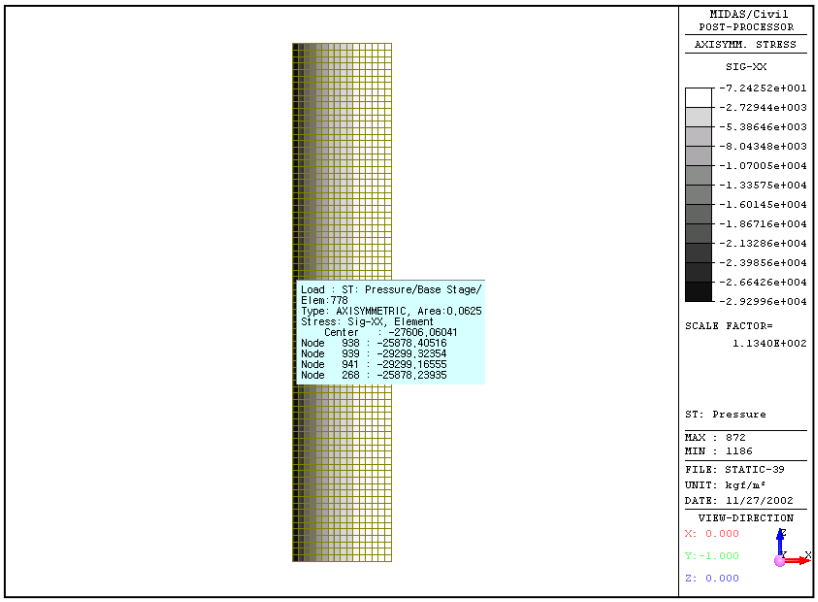
Load Case

Internal pressure load, P = 30,000 kgf/m^2

Results



The radial displacement (δ_X)



The radial stress (σ_r) at the inner surface at the middle wall thickness

Comparison of Results

Unit: m, kgf/m^2

Results	Theoretical	MIDAS/Civil
Displacement (δ_X)	0.007867	0.007862
Stress (σ_r)	30000.0	29299.3

Reference

Timoshenko, S. (1956). "*Strength of Materials, Part I1, Advanced Theory and Problems*", 3rd ed., D. Van Nostrand Co., Inc., New York, NY.