

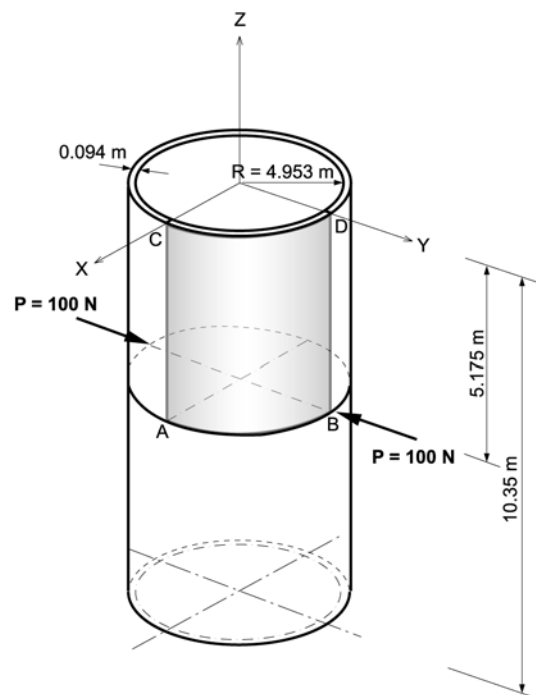
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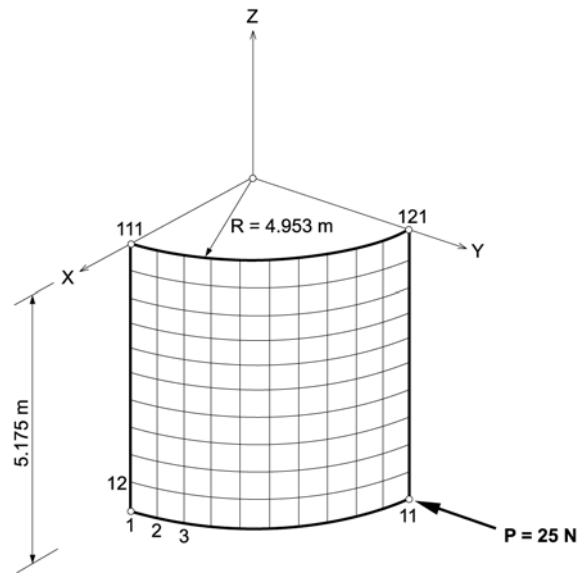
Title

Pinched thin-walled cylinder

Description

A thin-walled cylinder is pinched by a pair of forces at the middle of the cylinder. Determine the radial displacement at the target point B, where the force P is applied. The ends of the cylinder are free edges.





Structural geometry and analysis model

MODEL

Analysis Type

3-D static analysis

Unit System

m, N

Dimension

Height 10.35 m Radius 4.953 m

Element

Plate element (thin)

Material

Modulus of elasticity $E = 1.05 \times 10^7$ Pa

Poisson's ratio $\nu = 0.3125$

Sectional Property

Circular cross-section: radius 4.953 m, thickness 0.094 m

Boundary Condition

Node 1: Constrain D_Y , D_Z , R_X , R_Y and R_Z

Node 2~10: Constrain D_Z , R_X and R_Y

Node 11: Constrain D_X , D_Z , R_X , R_Y and R_Z

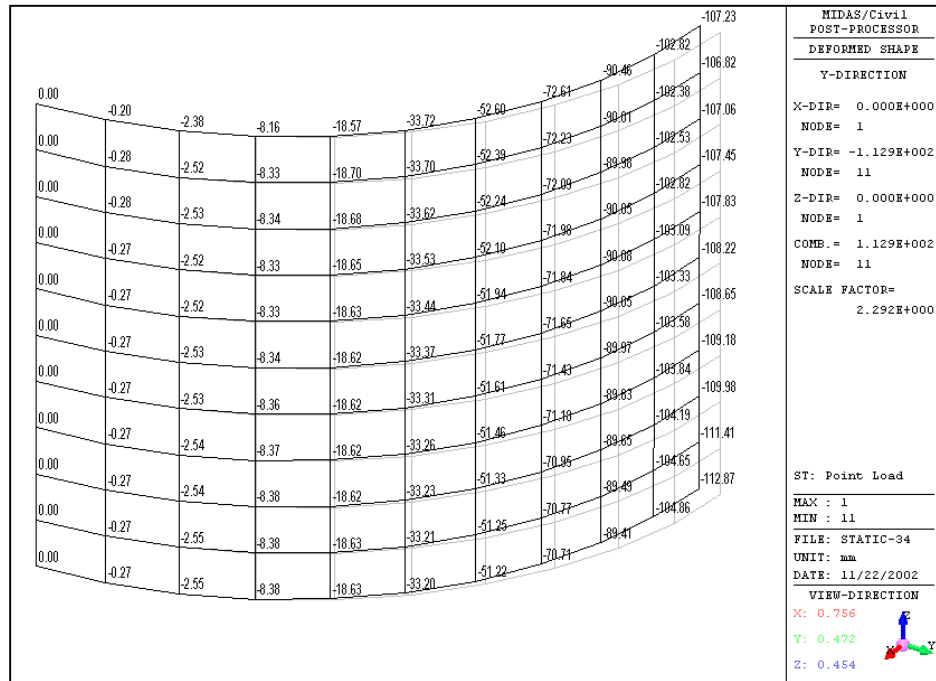
Node 12~111: Constrain D_Y , R_X and R_Z

Node 22~121: Constrain D_X , R_Y and R_Z

Load Case

A concentrated load, $P = 25$ N is applied at the middle of the cylinder length

Results



Displacements in the direction of the applied force P

Comparison of Results

Unit: mm

Results	Theoretical	MIDAS/Civil
Displacement (δ_Y)	-113.900	-112.87

References

Afnor (1990). "Guide de Validation des Progiciels de Calcul de Structures", SFM, Afnor Technique, France.

Takemoto, H., and Cook, R. D. (1973). “*Some Modification of an Isoparametric Shell Element*” Int. J. Num. Methods in Engrg., **7**(3).

Zienkiewicz, O. C. (1977). “*The Finite Element Method*”, 3rd ed., McGraw-Hill, London, UK.