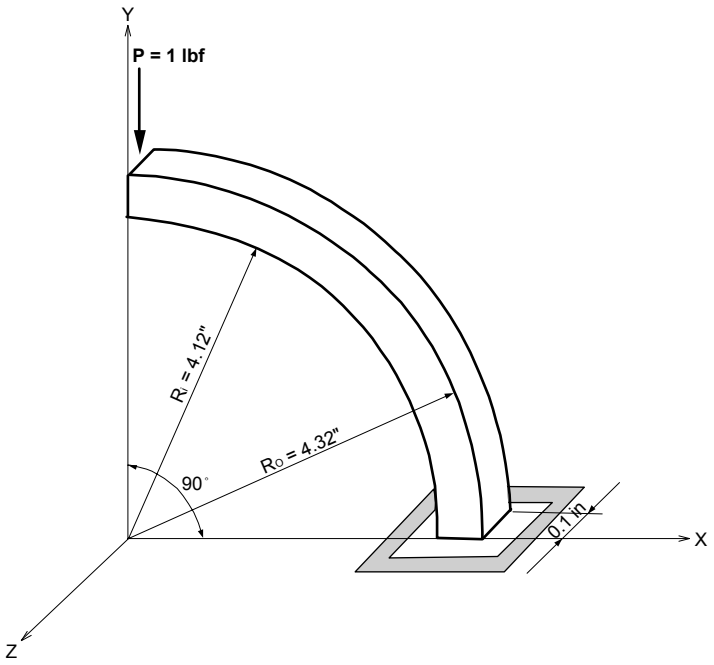
Static-35

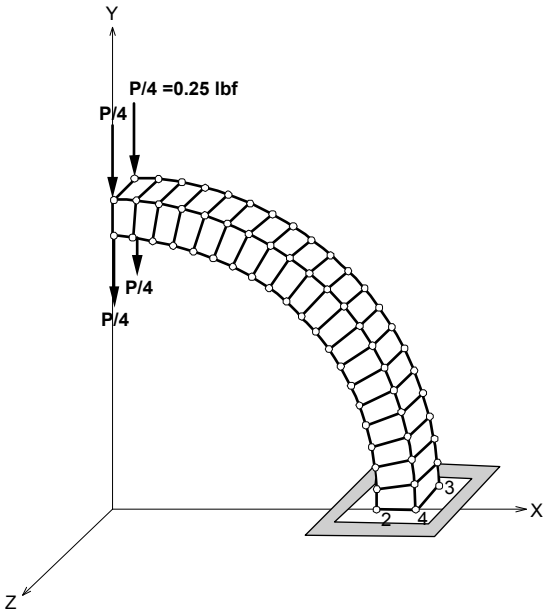
Title

Bending of a curved thick beam of a rectangular cross section

Description

A curved thick beam spanning a 90°arc is bent by a shear load applied at the top end. The bottom end is fixed while the top end is free.
Determine the deflections at the free end.





Structural geometry and analysis model

MODEL

Analysis Type

3-D static analysis

Unit System

in, lbf

Dimension

Outer radius 4.32 in Inner radius 4.12 in

Element

Solid element

Material

Modulus of elasticity $E = 10.0 \times 10^6$ psi
Poisson's ratio $\nu = 0.25$

Sectional Property

Rectangular cross-section: b = 0.1 in, h = 0.2 in

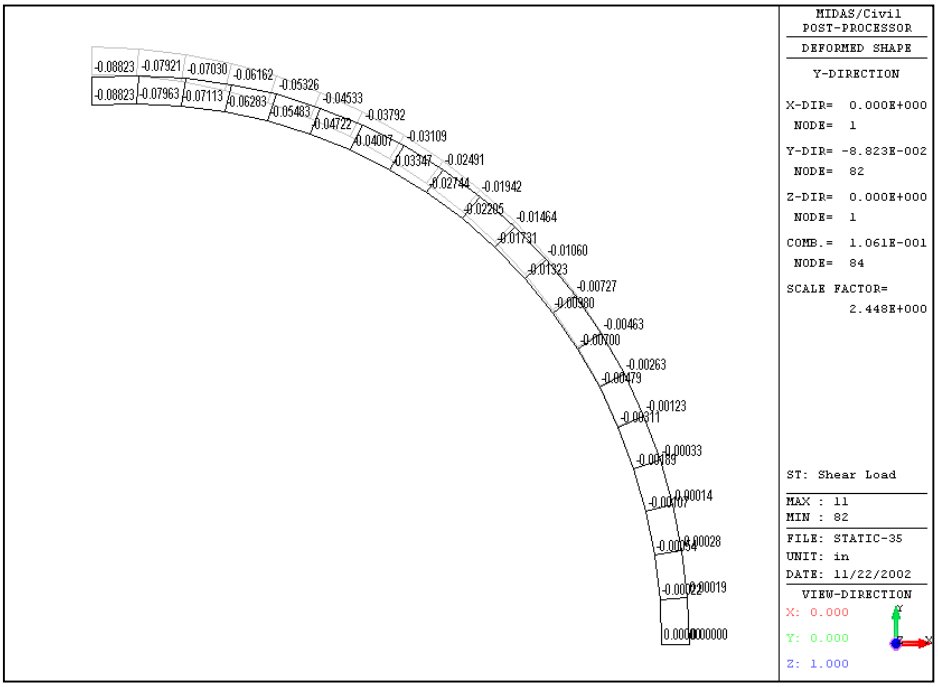
Boundary Condition

Node 1~4: Constrain all DOFs

Load Case

A shear load, P =1.0 lbf is applied at the top end

Results



Deflections at the free end

Comparison of Results

Unit: in

Results	Theoretical	MIDAS/Civil
Deflection (δ_Y)	-0.08814	-0.08823

Reference

Timoshenko, S. (1955). "*Strength of Materials, Part 1, Elementary theory*", 3rd ed., D. Van Nostrand Co., Inc., New York, NY.