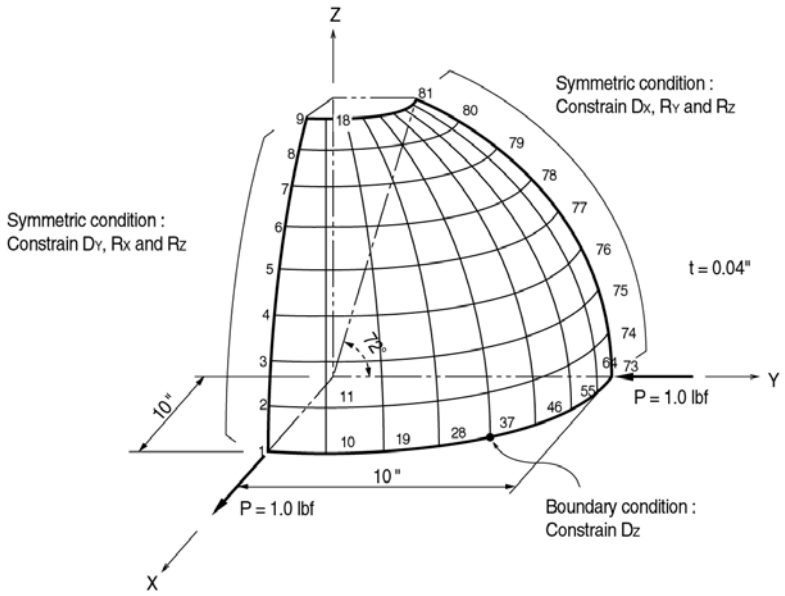
Static-24

Title

Hemispherical shell under concentrated loads

Description

Determine the displacements of a hemispherical shell subjected to concentrated tensile and compressive loads in two orthogonal radial directions.
Only a quarter model may be analyzed due to symmetry.



Structural geometry and analysis model (Quarter model)

MODEL

Analysis Type

3-D static analysis

Unit System

in, lbf

Dimension

Radius 10.0 in

Element

Plate element (Thick type)

Material

Modulus of elasticity $E = 6.825 \times 10^7$ psi

Poisson's ratio $\nu = 0.3$

Element Property

Element size : A quarter model is divided into 8 equal spaces in both directions along the surface

Thickness $t = 0.04$ in

Boundary Condition

Nodes 1 ~ 9 ; Constrain Dy, Rx and Rz. (Symmetric about X-Z plane)

Nodes 73 ~ 81 ; Constrain Dx, Ry and Rz. (Symmetric about Y-Z plane)

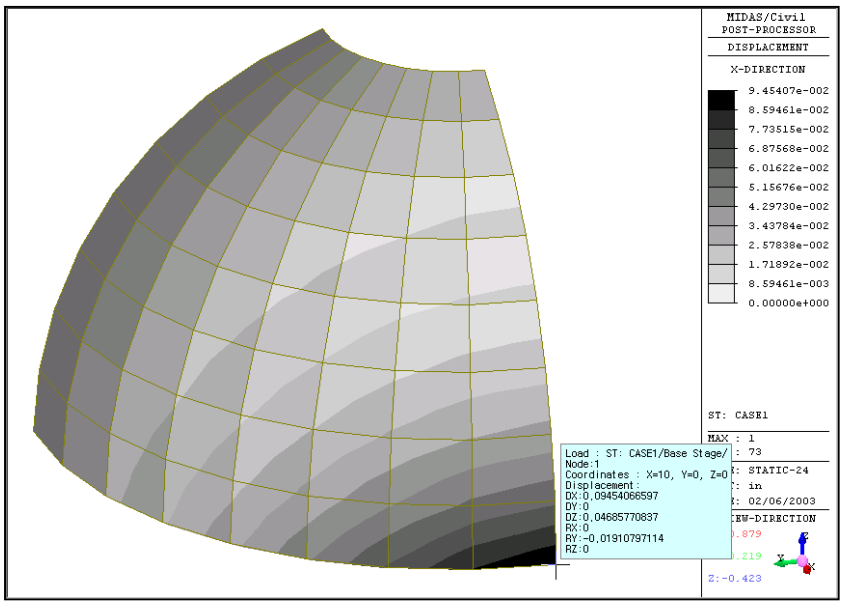
Node 37 ;Constrain Dz. (To prevent the rigid body motion in the Z direction)

Load Case

A concentrated load, 1.0 lbf is applied to the node 1 in the X direction.

A concentrated load, 1.0 lbf is applied to the node 73 in the -Y direction.

Results



X-displacements of the structure (Node 1)

Comparison of Results

Unit : in

Node	X-displacement (δ_x)	
	Ref. 1	MIDAS/Civil
1	0.0940	0.0948

Reference

MacNeal, R. H. and Harder, R. C., "*Proposed Standard Set of Problems to Test Finite Element Accuracy*", Finite Elements in Analysis and Design 1, 1985, pp. 3-20, North-Holland.