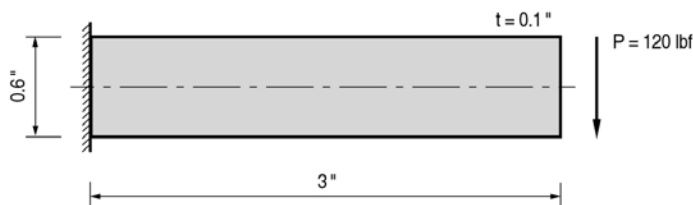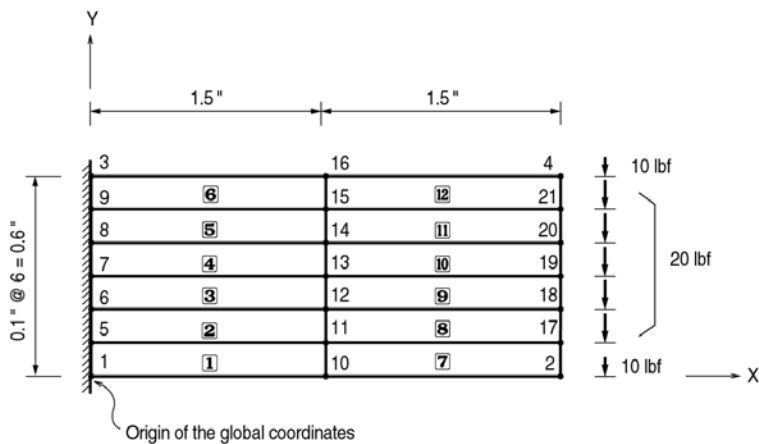# Static-12

Title

Cantilever beam with an in-plane vertical load at the free end.

Description

Find deflections of the cantilever beam subjected to an in-plane vertical load at the free end.

(a) Cantilever beam with an in-plane vertical load at the free end

(b) Finite element model

Structural geometry and analysis model

Model

Analysis Type
2-D static analysis (X-Y plane)

Unit System
in, lbf

Dimension
Length 3.0 in   Depth 0.6 in   Thickness 0.1 in

Element
Plate element (Thick type)

Material
Modulus of elasticity $E = 10.7 \times 10^6$ psi
Poisson's ratio $\nu = 0.3$

Element Property
Size $a \times b = 1.5$ in $\times 0.1$ in
Thickness $t = 0.1$ in

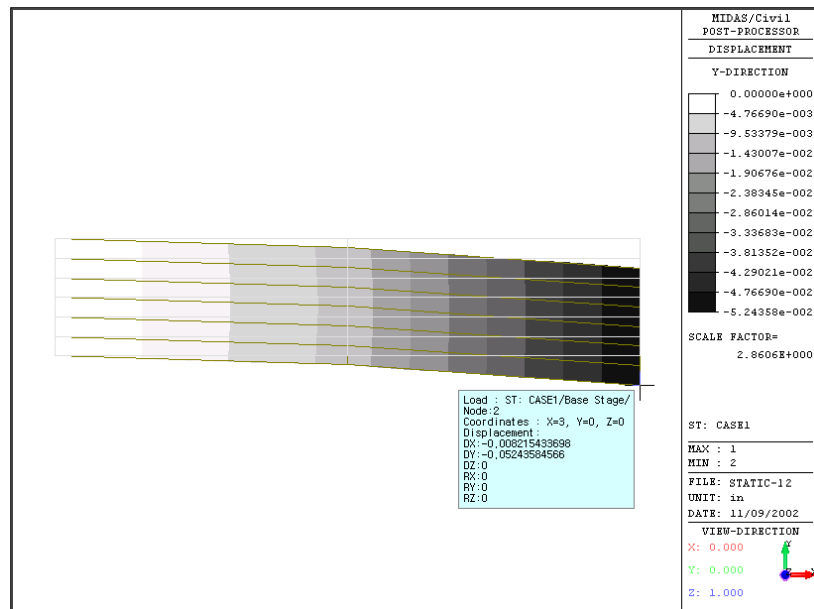### *Boundary Condition*
Nodes 1, 3, 5 ~ 9 ; Constrain Dx and Dy.

Load Case
An in-plane vertical load, P = 120 lbf is distributed over the free end nodes as noted
below.

Top and bottom nodes 2 and 4   = 10 lbf
Intermediate nodes 17~21   = 20 lbf

Results

Y-displacements of the structure (Node 2)

Comparison of Results

Unit : in

Node 2	MSC/NASTRAN	STAAD/PRO	MIDAS/Civil
Maximum δy	-0.05224233	-0.05438000	-0.05243585

References

"*MSC/NASTRAN Verification Problem Manual*", V.64, The MacNeal-Schwendler Corporation, 1986, Problem No. V2408A.

"*STAAD-III/ISDS, Getting Started and Example Manual*", Research Engineers, Inc., 1994.