

Types of Idealizations

- 3D Solid
- Plane Stress
- Plane Strain
- 3D Shell
- Beam
- Cyclic Symmetry















Add More Features

- Fix problems if any are found
 - Add some features
 - Do a 3D analysis
 - Fix problems if any are found
 - Add more features
 - Compare results with last step
 - Reduce the problem size with symmetry



















Use of Symmetry

- Full featured part
- De-featured part
- Part size reduced with symmetrical boundary conditions
- Part size reduced with asymmetrical boundary conditions
- Part size reduced with both symmetrical and asymmetrical boundary conditions



Analysis Results		
Number of elements	370	
Number of Passes	6	
Edge Order	6	
CPU Time	26.38	
Maximum Displacement	3.44x10 ⁻⁵	
Von Mises Stress	14,500	





Analysis Results		
Number of elements	94	
Number of Passes	5	
Edge Order	5	
CPU Time	3.39	
Maximum Displacement	3.33x10 ⁻⁵	
Von Mises Stress	13,300	



XY Plane	YZ Plane) (7 D)
		XZ Plane
Free	Fixed	Free
Free	Free	Fixed
Fixed	Free	Free
Fixed	Free	Fixed
Fixed	Fixed	Free
Free	Fixed	Fixed
	Free Fixed Fixed Fixed Free	FreeFreeFixedFreeFixedFreeFixedFixedFreeFixed



Analysis Results		
Number of elements	86	
Number of Passes	6	
Edge Order	6	
CPU Time	6.16	
Maximum Displacement	3.34x10 ⁻⁵	
Von Mises Stress	14,200	



Asymmetrical Boundary Conditions						
XY Plane YZ Plane XZ Plane						
Trans X	Fixed	Free	Fixed			
Trans Y	Fixed	Fixed	Free			
Trans Z	Free	Fixed	Fixed			
Rotate X	Free	Fixed	Free			
Rotate Y	Free	Free	Fixed			
Rotate Z	Fixed	Free	Free			



Analysis Results		
Number of elements	56	
Number of Passes	6	
Edge Order	6	
CPU Time	4.36	
Maximum Displacement	3.32x10 ⁻⁵	
Von Mises Stress	13,300	









	Element	Passes	CPU	Disp	VM Stress
Full	370	6	26.38	3.44x10 ⁻⁵	14,500
Defea	94	5	3,39	3.33x10 ⁻⁵	13,300
Sym	86	6	6.16	3.34x10 ⁻⁵	14,200
Asym	56	6	4.36	3.32x10 ⁻⁵	13,300
Asym- Sym	33	7	4.69	3.34x10 ⁻⁵	13,400

Constraining Translation

- Fully constrained face
- Partially restrained face with a constrained point
- Symmetrical boundary condition with small constrained region
- Symmetry used to constrain translation







Analysis Results		
Number of elements	35	
Number of Passes	5	
Edge Order	5	
CPU Time	1.77	
Maximum Displacement	3.33x10 ⁻⁶	
Von Mises Stress	32,700	





Analysis Results		
Number of elements	51	
Number of Passes	5	
Edge Order	5	
CPU Time	1.72	
Maximum Displacement	3.34x10 ⁻⁶	
Von Mises Stress	30,000	
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Analysis Results		
Number of elements	51	
Number of Passes	5	
Edge Order	5	
CPU Time	1.62	
Maximum Displacement	3.34x10 ⁻⁶	
Von Mises Stress	30,000	





Analysis Results		
Number of elements	21	
Number of Passes	5	
Edge Order	5	
CPU Time	1.11	
Maximum Displacement	3.36x10 ⁻⁶	
Von Mises Stress	31,200	
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Link Results					
	Elements	Passes	CPU	Displace	VM Stress
Half Part	35	5	1.77	1.33x10 ⁻⁶	32,700
Fixed Point	51	5	1.72	1.34x10 ⁻⁶	30,000
Fixed Region	51	5	1.62	1.34x10 ⁻⁶	30,000
Symmetry	21	5	1.11	1.36x10 ⁻⁶	31,200







