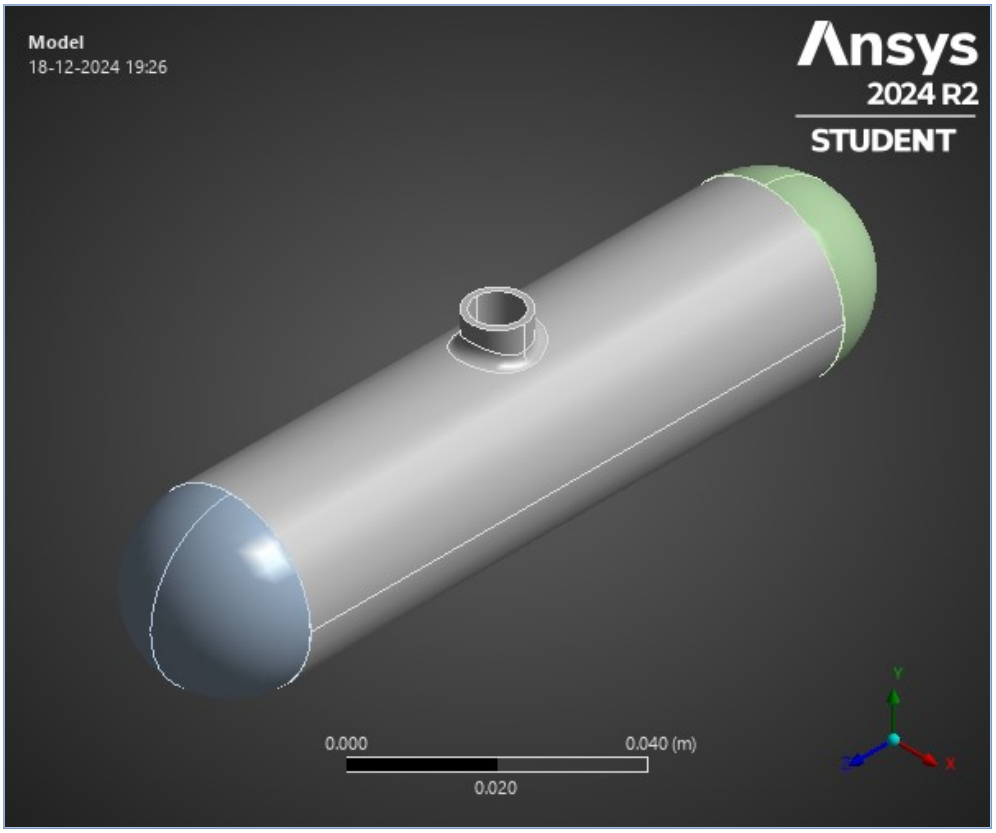
Project

First Saved	Wednesday, December 18, 2024
Last Saved	Wednesday, December 18, 2024
Product Version	2024 R2
Save Project Before Solution	No
Save Project After Solution	No



Contents

Units

TABLE 1

Unit System	Metric (m, kg, N, s, V, A) Degrees rad/s Celsius
Angle	Degrees
Rotational Velocity	rad/s
Temperature	Celsius

Model (A4)

TABLE 2
Model (A4) > Geometry Imports

Object Name	*Geometry Imports*
State	Solved

TABLE 3
Model (A4) > Geometry Imports > Geometry Import (A3)

Object Name	*Geometry Import (A3)*
State	Solved
Definition	
Source	C:\Users\shrey\OneDrive\Desktop\Ansys\Assignment 3 Model.stp
Type	Step
Basic Geometry Options	
Solid Bodies	Yes
Surface Bodies	Yes
Line Bodies	No
Parameters	Independent
Parameter Key	ANS;DS
Attributes	No
Named Selections	No
Material Properties	No
Advanced Geometry Options	
Use Associativity	Yes
Coordinate Systems	No
Reader Mode Saves Updated File	No
Use Instances	Yes

Smart CAD Update	Yes
Compare Parts On Update	No
Analysis Type	3-D
Mixed Import Resolution	None
Import Facet Quality	Source
Clean Bodies On Import	No
Stitch Surfaces On Import	None
Decompose Disjoint Geometry	Yes
Enclosure and Symmetry Processing	Yes

Geometry

TABLE 4
Model (A4) > Geometry

Object Name	*Geometry*
State	Fully Defined
Definition	
Source	C:\Users\shrey\OneDrive\Desktop\Ansys\Assignment 3 Model.stp
Type	Step
Length Unit	Millimeters
Element Control	Program Controlled
Display Style	Body Color
Bounding Box	
Length X	3.e-002 m
Length Y	3.5e-002 m
Length Z	0.13 m
Properties	
Volume	2.2434e-005 m³
Mass	0.17611 kg
Scale Factor Value	1.
Statistics	
Bodies	3
Active Bodies	3
Nodes	115648
Elements	65883
Mesh Metric	None
Update Options	
Assign Default Material	No
Basic Geometry Options	
Solid Bodies	Yes
Surface Bodies	Yes
Line Bodies	No
Parameters	Independent
Parameter Key	ANS;DS
Attributes	No
Named Selections	No
Material Properties	No
Advanced Geometry Options	
Use Associativity	Yes
Coordinate Systems	No
Reader Mode Saves Updated File	No
Use Instances	Yes
Smart CAD Update	Yes
Compare Parts On Update	No
Analysis Type	3-D
Mixed Import Resolution	None
Import Facet Quality	Source
Clean Bodies On Import	No
Stitch Surfaces On Import	None
Decompose Disjoint Geometry	Yes
Enclosure and Symmetry Processing	Yes

TABLE 5
Model (A4) > Geometry > Parts

Object Name	*RESERVOIR|RESERVOIR*	*SPHERICAL_COVER|SPHERICAL_COVER*	*SPHERICAL_COVER|SPHERICAL_COVER [2]*
State	Meshed		
Graphics Properties			
Visible	Yes		
Transparency	1		
Definition			
Suppressed	No		
Stiffness Behavior	Flexible		
Coordinate System	Default Coordinate System		
Reference Temperature	By Environment		
Treatment	None		
Material			
Assignment	Structural Steel		
Nonlinear Effects	Yes		
Thermal Strain Effects	Yes		
Bounding Box			
Length X	3.e-002 m		
Length Y	3.5e-002 m	3.e-002 m	
Length Z	0.1 m	3.e-002 m	
Properties			
Volume	1.7536e-005 m³	2.4491e-006 m³	
Mass	0.13766 kg	1.9226e-002 kg	
Centroid X	-7.6034e-011 m	9.9028e-019 m	-9.9028e-019 m
Centroid Y	1.2363e-004 m	-1.5596e-019 m	
Centroid Z	-1.325e-010 m	5.6998e-002 m	-5.6998e-002 m
Moment of Inertia Ip1	1.2781e-004 kg·m²	1.574e-006 kg·m²	
Moment of Inertia Ip2	1.2751e-004 kg·m²	1.5729e-006 kg·m²	
Moment of Inertia Ip3	2.7019e-005 kg·m²	2.5123e-006 kg·m²	
Statistics			
Nodes	40948	37350	
Elements	21479	22202	
Mesh Metric	None		

TABLE 6
Model (A4) > Materials

Object Name	*Materials*
State	Fully Defined
Statistics	
Materials	1
Material Assignments	0

Coordinate Systems

TABLE 7
Model (A4) > Coordinate Systems > Coordinate System

Object Name	*Global Coordinate System*
State	Fully Defined
Definition	
Type	Cartesian
Coordinate System ID	0.
Origin	
Origin X	0. m
Origin Y	0. m
Origin Z	0. m
Directional Vectors	
X Axis Data	[1. 0. 0.]

Y Axis Data	[0. 1. 0.]
Z Axis Data	[0. 0. 1.]
Transfer Properties	
Source	
Read Only	No

Connections

TABLE 8
Model (A4) > Connections

Object Name	*Connections*
State	Fully Defined
Auto Detection	
Generate Automatic Connection On Refresh	Yes
Transparency	
Enabled	Yes
Statistics	
Contacts	2
Active Contacts	2
Joints	0
Active Joints	0
Beams	0
Active Beams	0
Bearings	0
Active Bearings	0
Springs	0
Active Springs	0
Body Interactions	0
Active Body Interactions	0

TABLE 9
Model (A4) > Connections > Contacts

Object Name	*Contacts*
State	Fully Defined
Definition	
Connection Type	Contact
Scope	
Scoping Method	Geometry Selection
Geometry	All Bodies
Auto Detection	
Tolerance Type	Slider
Tolerance Slider	0.
Tolerance Value	3.4483e-004 m
Use Range	No
Face/Face	Yes
Face-Face Angle Tolerance	75. °
Face Overlap Tolerance	Off
Cylindrical Faces	Include
Face/Edge	No
Edge/Edge	No
Priority	Include All
Group By	Bodies
Search Across	Bodies
Statistics	
Connections	2
Active Connections	2

TABLE 10
Model (A4) > Connections > Contacts > Contact Regions

Object Name	*Contact Region*	*Contact Region 2*
State	Fully Defined	
Scope		
Scoping Method	Geometry Selection	
Contact	1 Face	

Target	1 Face	
Contact Bodies	RESERVOIR|RESERVOIR	
Target Bodies	SPHERICAL_COVER|SPHERICAL_COVER	SPHERICAL_COVER|SPHERICAL_COVER[2]
Protected	No	
Definition		
Type	Bonded	
Scope Mode	Automatic	
Behavior	Program Controlled	
Trim Contact	Program Controlled	
Trim Tolerance	3.4483e-004 m	
Contact APDL Name		
Target APDL Name		
Suppressed	No	
Display		
Element Normals	No	
Advanced		
Formulation	Program Controlled	
Small Sliding	Program Controlled	
Detection Method	Program Controlled	
Penetration Tolerance	Program Controlled	
Elastic Slip Tolerance	Program Controlled	
Normal Stiffness	Program Controlled	
Update Stiffness	Program Controlled	
Pinball Region	Program Controlled	
Geometric Modification		
Contact Geometry Correction	None	
Target Geometry Correction	None	

Mesh

TABLE 11
Model (A4) > Mesh

Object Name	*Mesh*
State	Solved
Display	
Display Style	Use Geometry Setting
Defaults	
Physics Preference	Mechanical
Element Order	Program Controlled
Element Size	Default
Sizing	
Use Adaptive Sizing	Yes
Resolution	6
Mesh Defeaturing	Yes
Defeature Size	Default
Transition	Fast
Span Angle Center	Coarse
Initial Size Seed	Assembly
Bounding Box Diagonal	0.13793 m
Average Surface Area	1.0178e-003 m²
Minimum Edge Length	2.2928e-003 m
Quality	
Check Mesh Quality	Yes, Errors
Error Limits	Aggressive Mechanical
Target Element Quality	Default (5.e-002)
Smoothing	Medium
Mesh Metric	None
Inflation	
Use Automatic Inflation	None
Inflation Option	Smooth Transition
Transition Ratio	0.272
Maximum Layers	5
Growth Rate	1.2
Inflation Algorithm	Pre

Inflation Element Type	Wedges
View Advanced Options	No
Advanced	
Number of CPUs for Parallel Part Meshing	Program Controlled
Straight Sided Elements	No
Rigid Body Behavior	Dimensionally Reduced
Triangle Surface Mesher	Program Controlled
Topology Checking	Yes
Pinch Tolerance	Please Define
Generate Pinch on Refresh	No
Statistics	
Nodes	115648
Elements	65883
Show Detailed Statistics	No

TABLE 12
Model (A4) > Mesh > Mesh Controls

Object Name	*Patch Conforming Method*
State	Fully Defined
Scope	
Scoping Method	Geometry Selection
Geometry	3 Bodies
Definition	
Suppressed	No
Method	Tetrahedrons
Algorithm	Patch Conforming
Element Order	Use Global Setting
Advanced Improve Options	
Aggressive Thin Face Collapse	Program Controlled
Automatic Node Movement	Program Controlled
Refinement Options	
Refine at Thin Section	No

Static Structural (A5)

TABLE 13
Model (A4) > Analysis

Object Name	*Static Structural (A5)*
State	Solved
Definition	
Physics Type	Structural
Analysis Type	Static Structural
Solver Target	Mechanical APDL
Options	
Environment Temperature	22. °C
Generate Input Only	No

TABLE 14
Model (A4) > Static Structural (A5) > Analysis Settings

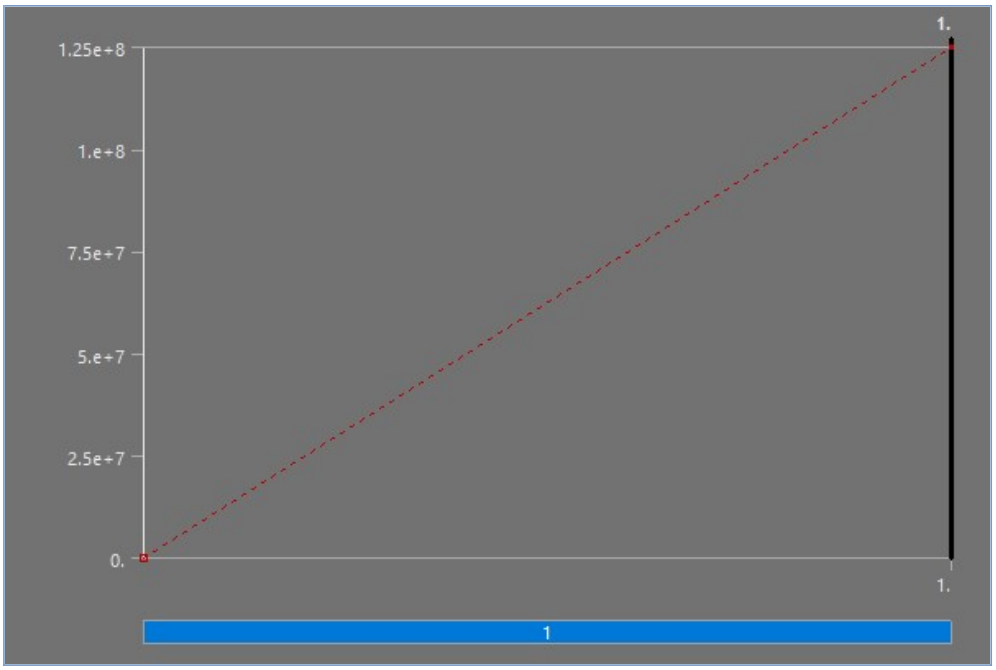
Object Name	*Analysis Settings*
State	Fully Defined
Step Controls	
Number Of Steps	1.
Current Step Number	1.
Step End Time	1. s
Auto Time Stepping	Program Controlled
Solver Controls	
Solver Type	Program Controlled
Weak Springs	Off
Solver Pivot Checking	Program Controlled
Large Deflection	Off
Inertia Relief	Off
Quasi-Static Solution	Off
Rotordynamics Controls	

Coriolis Effect	Off
Restart Controls	
Generate Restart Points	Program Controlled
Retain Files After Full Solve	No
Combine Restart Files	Program Controlled
Nonlinear Controls	
Newton-Raphson Option	Program Controlled
Force Convergence	Program Controlled
Moment Convergence	Program Controlled
Displacement Convergence	Program Controlled
Rotation Convergence	Program Controlled
Line Search	Program Controlled
Stabilization	Program Controlled
Advanced	
Inverse Option	No
Contact Split (DMP)	Program Controlled
Output Controls	
Output Selection	None
Stress	Yes
Back Stress	No
Strain	Yes
Contact Data	Yes
Nonlinear Data	No
Nodal Forces	No
Volume and Energy	Yes
Euler Angles	Yes
General Miscellaneous	No
Contact Miscellaneous	No
Store Results At	All Time Points
Result File Compression	Program Controlled
Analysis Data Management	
Solver Files Directory	C:\Users\shrey\OneDrive\Documents\Pressure Vessel_files\dp0\SYS\MECH\
Future Analysis	None
Scratch Solver Files Directory	
Save MAPDL db	No
Contact Summary	Program Controlled
Delete Unneeded Files	Yes
Nonlinear Solution	No
Solver Units	Active System
Solver Unit System	mks

TABLE 15
Model (A4) > Static Structural (A5) > Loads

Object Name	*Fixed Support*	*Pressure*
State	Fully Defined	
Scope		
Scoping Method	Geometry Selection	
Geometry	1 Face	8 Faces
Definition		
Type	Fixed Support	Pressure
Suppressed	No	
Define By		Normal To
Applied By		Surface Effect
Loaded Area		Deformed
Magnitude		1.25e+008 Pa (ramped)

FIGURE 1
Model (A4) > Static Structural (A5) > Pressure



Solution (A6)

TABLE 16
Model (A4) > Static Structural (A5) > Solution

Object Name	*Solution (A6)*
State	Solved
Adaptive Mesh Refinement	
Max Refinement Loops	1.
Refinement Depth	2.
Information	
Status	Done
MAPDL Elapsed Time	12. s
MAPDL Memory Used	912. MB
MAPDL Result File Size	44.813 MB
Post Processing	
Beam Section Results	No
On Demand Stress/Strain	No

TABLE 17
Model (A4) > Static Structural (A5) > Solution (A6) > Solution Information

Object Name	*Solution Information*
State	Solved
Solution Information	
Solution Output	Solver Output
Newton-Raphson Residuals	0
Identify Element Violations	0
Update Interval	2.5 s
Display Points	All
FE Connection Visibility	
Activate Visibility	Yes
Display	All FE Connectors
Draw Connections Attached To	All Nodes
Line Color	Connection Type
Visible on Results	No
Line Thickness	Single
Display Type	Lines

TABLE 18
Model (A4) > Static Structural (A5) > Solution (A6) > Results

					Total	

Object Name	*Axial Stress*	*Hoop Stress*	*Radial Stress*	*Diameter*	*Deformation*	*Longitudinal*
State	Solved					
Scope						
Scoping Method	Geometry Selection					
Geometry	All Bodies					
Definition						
Type	Normal Stress			Directional Deformation	Total Deformation	Directional Deformation
Orientation	Z Axis	Y Axis	X Axis			Z Axis
By	Time					
Display Time	Last					
Separate Data by Entity	No					
Coordinate System	Global Coordinate System					Global Coordinate System
Calculate Time History	Yes					
Identifier						
Suppressed	No					
Integration Point Results						
Display Option	Averaged					
Average Across Bodies	No					
Results						
Minimum	-4.6387e+008 Pa	-1.0822e+009 Pa	-4.6276e+008 Pa	-6.646e-005 m	0. m	-5.6963e-005 m
Maximum	1.187e+009 Pa	9.3183e+008 Pa	2.8803e+009 Pa	6.642e-005 m	1.0249e-004 m	5.6999e-005 m
Average	2.8221e+008 Pa	2.9219e+008 Pa	2.9483e+008 Pa	5.2353e-008 m	6.8533e-005 m	1.2643e-008 m
Minimum Occurs On	RESERVOIR|RESERVOIR					SPHERICAL_COVER|SPHERICAL_COVER [2]
Maximum Occurs On	RESERVOIR|RESERVOIR					SPHERICAL_COVER|SPHERICAL_COVER
Information						
Time	1. s					
Load Step	1					
Substep	1					
Iteration Number	1					

FIGURE 2
Model (A4) > Static Structural (A5) > Solution (A6) > Axial Stress

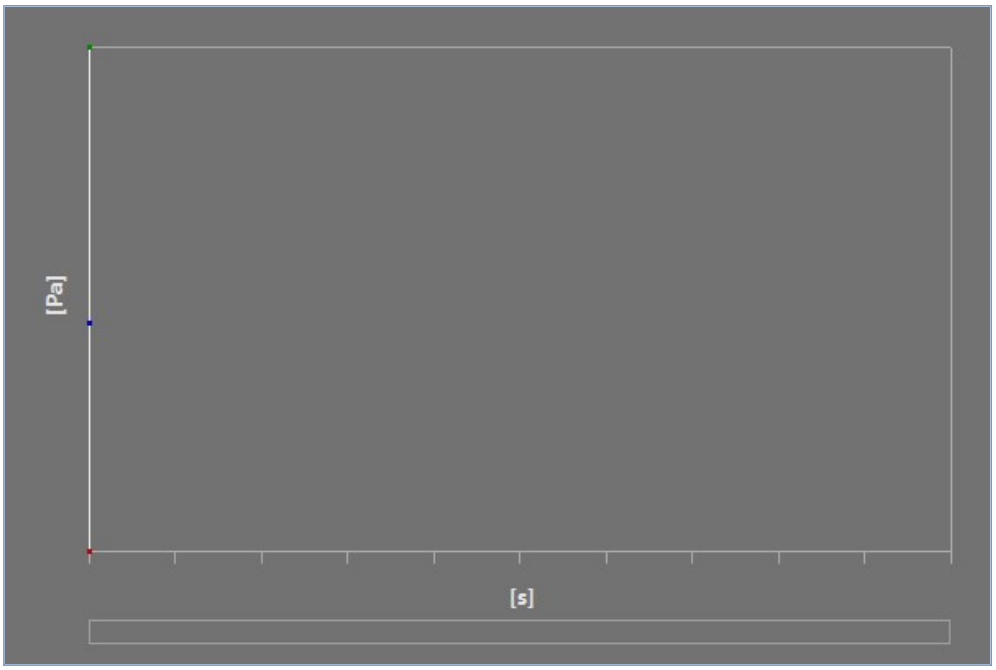


TABLE 19
Model (A4) > Static Structural (A5) > Solution (A6) > Axial Stress

Time [s]	Minimum [Pa]	Maximum [Pa]	Average [Pa]
1.	-4.6387e+008	1.187e+009	2.8221e+008

FIGURE 3
Model (A4) > Static Structural (A5) > Solution (A6) > Hoop Stress

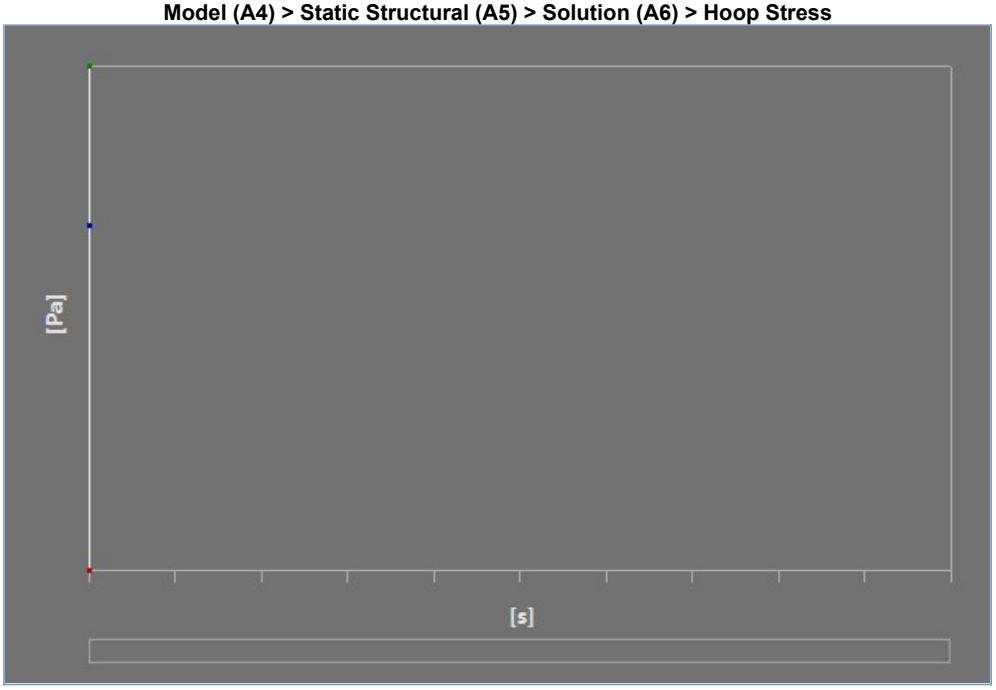


TABLE 20
Model (A4) > Static Structural (A5) > Solution (A6) > Hoop Stress

Time [s]	Minimum [Pa]	Maximum [Pa]	Average [Pa]
1.	-1.0822e+009	9.3183e+008	2.9219e+008

FIGURE 4
Model (A4) > Static Structural (A5) > Solution (A6) > Radial Stress

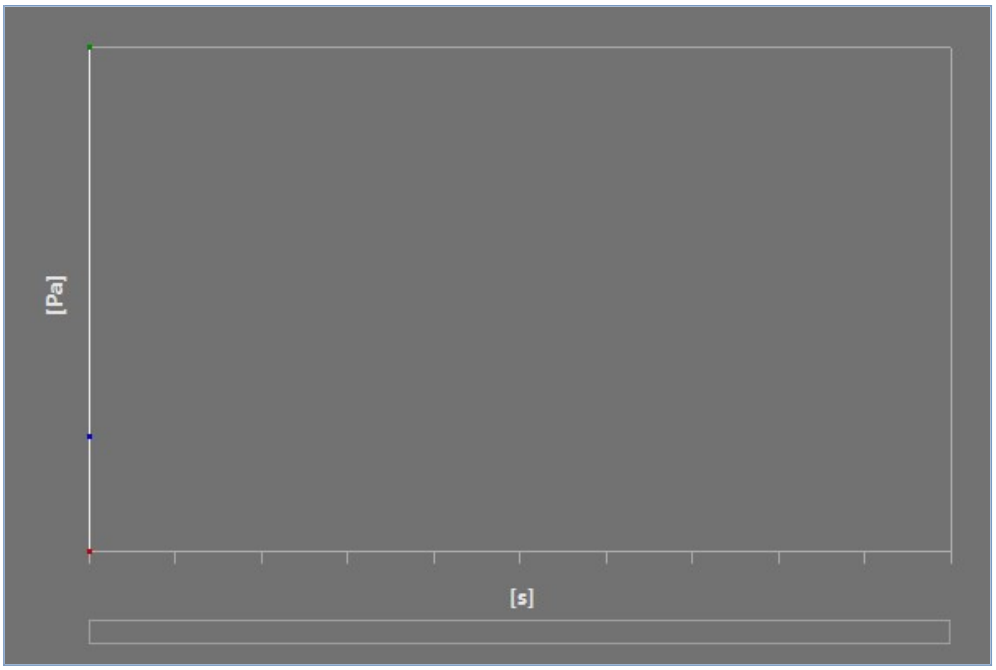


TABLE 21
Model (A4) > Static Structural (A5) > Solution (A6) > Radial Stress

Time [s]	Minimum [Pa]	Maximum [Pa]	Average [Pa]
1.	-4.6276e+008	2.8803e+009	2.9483e+008

FIGURE 5
Model (A4) > Static Structural (A5) > Solution (A6) > Diameter

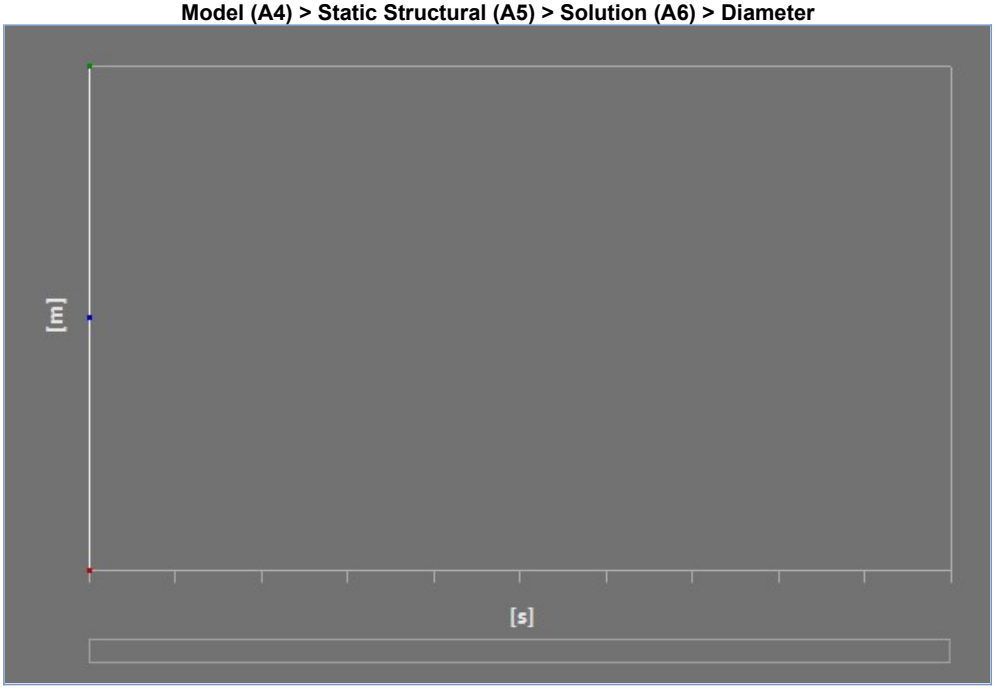


TABLE 22
Model (A4) > Static Structural (A5) > Solution (A6) > Diameter

Time [s]	Minimum [m]	Maximum [m]	Average [m]
1.	-6.646e-005	6.642e-005	5.2353e-008

FIGURE 6
Model (A4) > Static Structural (A5) > Solution (A6) > Total Deformation

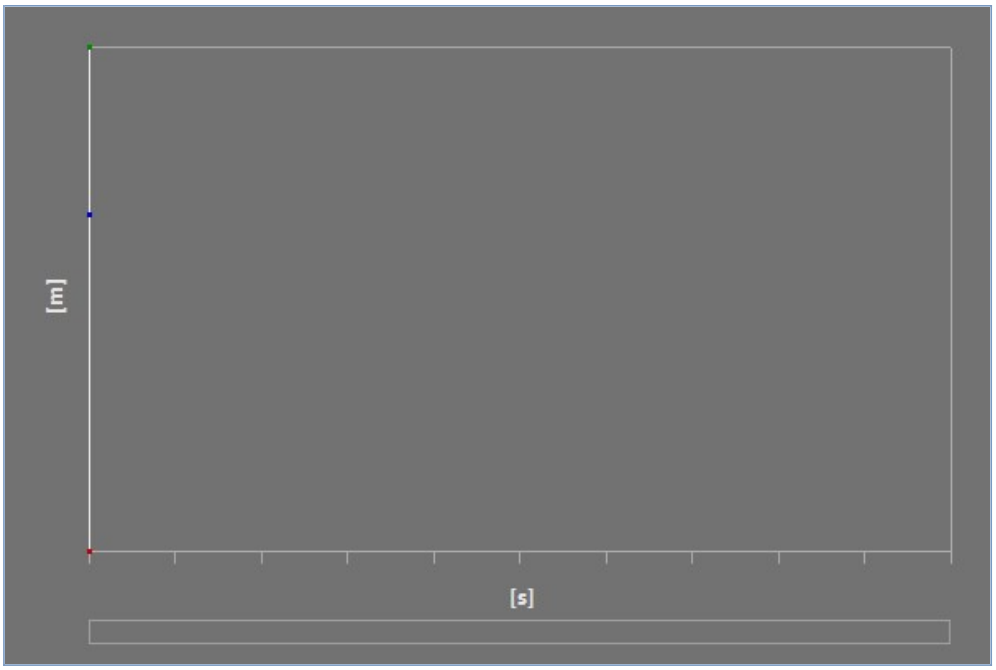


TABLE 23
Model (A4) > Static Structural (A5) > Solution (A6) > Total Deformation

Time [s]	Minimum [m]	Maximum [m]	Average [m]
1.	0.	1.0249e-004	6.8533e-005

FIGURE 7
Model (A4) > Static Structural (A5) > Solution (A6) > Longitudinal

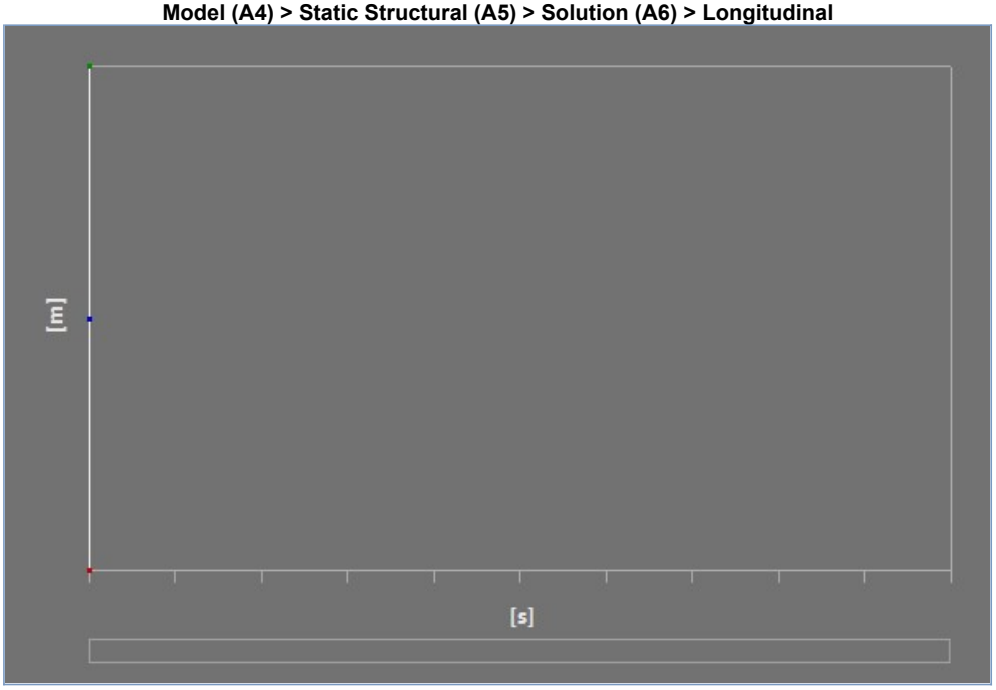


TABLE 24
Model (A4) > Static Structural (A5) > Solution (A6) > Longitudinal

Time [s]	Minimum [m]	Maximum [m]	Average [m]
1.	-5.6963e-005	5.6999e-005	1.2643e-008

Material Data

Structural Steel

TABLE 25
Structural Steel > Constants

Density	7850 kg m^-3
Coefficient of Thermal Expansion	1.2e-005 C^-1
Specific Heat	434 J kg^-1 C^-1
Thermal Conductivity	60.5 W m^-1 C^-1
Resistivity	1.7e-007 ohm m

TABLE 26
Structural Steel > Color

Red	Green	Blue
132	139	179

TABLE 27
Structural Steel > Compressive Ultimate Strength

Compressive Ultimate Strength Pa
0

TABLE 28
Structural Steel > Compressive Yield Strength

Compressive Yield Strength Pa
2.5e+008

TABLE 29
Structural Steel > Tensile Yield Strength

Tensile Yield Strength Pa
2.5e+008

TABLE 30
Structural Steel > Tensile Ultimate Strength

Tensile Ultimate Strength Pa
4.6e+008

TABLE 31
Structural Steel > Isotropic Secant Coefficient of Thermal Expansion

Zero-Thermal-Strain Reference Temperature C
22

TABLE 32
Structural Steel > S-N Curve

Alternating Stress Pa	Cycles	Mean Stress Pa
3.999e+009	10	0
2.827e+009	20	0
1.896e+009	50	0
1.413e+009	100	0
1.069e+009	200	0
4.41e+008	2000	0
2.62e+008	10000	0
2.14e+008	20000	0
1.38e+008	1.e+005	0
1.14e+008	2.e+005	0
8.62e+007	1.e+006	0

TABLE 33
Structural Steel > Strain-Life Parameters

Strength Coefficient Pa	Strength Exponent	Ductility Coefficient	Ductility Exponent	Cyclic Strength Coefficient Pa	Cyclic Strain Hardening Exponent
9.2e+008	-0.106	0.213	-0.47	1.e+009	0.2

TABLE 34
Structural Steel > Isotropic Elasticity

Young's Modulus Pa	Poisson's Ratio	Bulk Modulus Pa	Shear Modulus Pa	Temperature C
2.e+011	0.3	1.6667e+011	7.6923e+010	

TABLE 35
Structural Steel > Isotropic Relative Permeability

Relative Permeability
10000