



Simulation of Flexure part

Date: Wednesday, December 4, 2024
Designer: Zulfiqar Islam
Study name: Compression
Analysis type: Static

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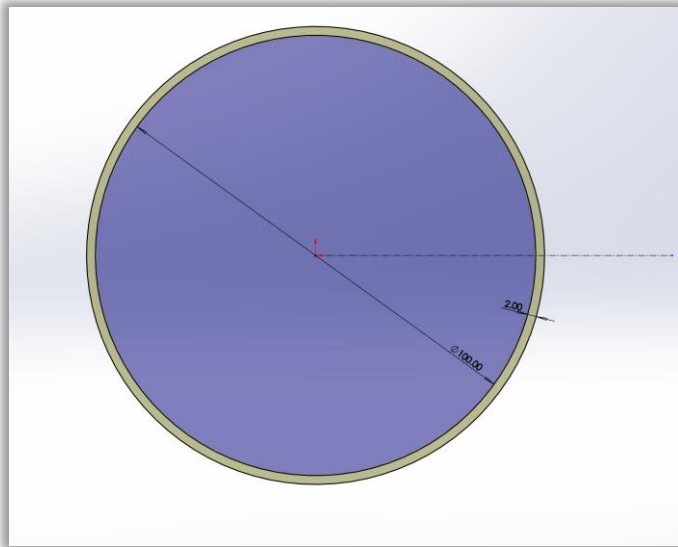
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Description
No Data

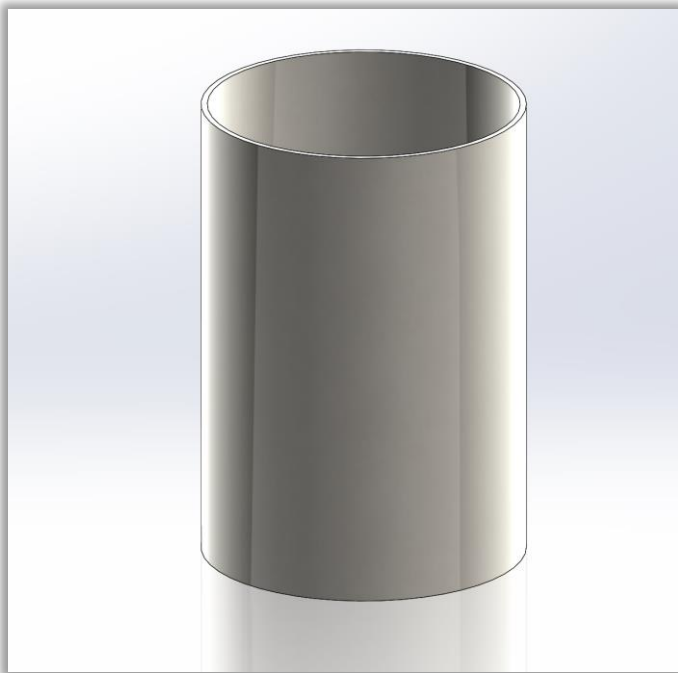


Making of model

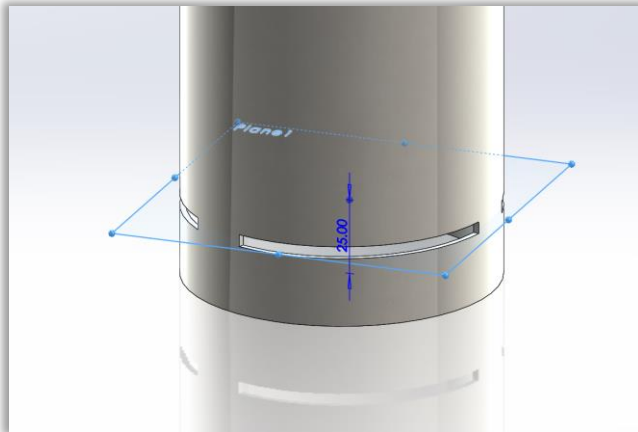
1. Draw the sketch on top plane



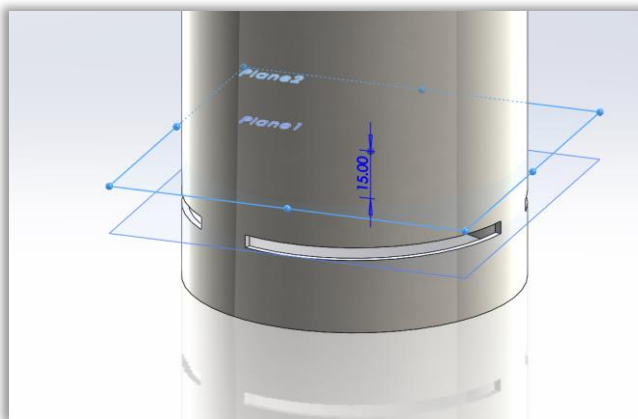
2. Extrude 150mm



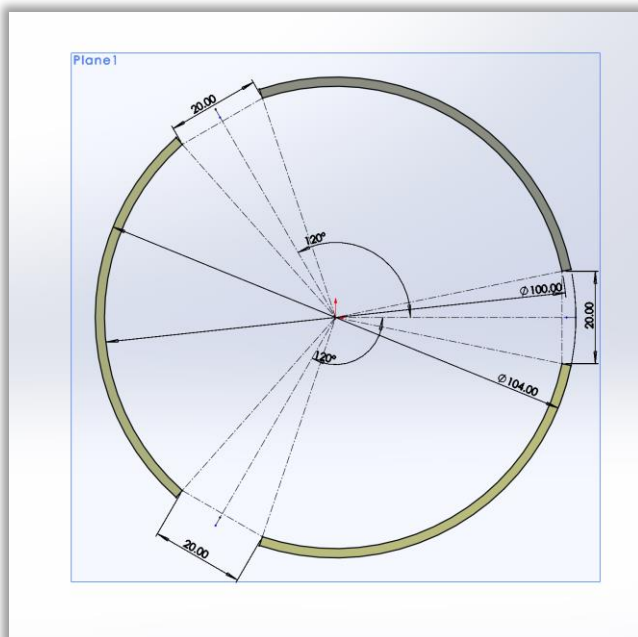
3. Insert a plane 25mm from top plane



4. Insert a plane 15mm from plane 1



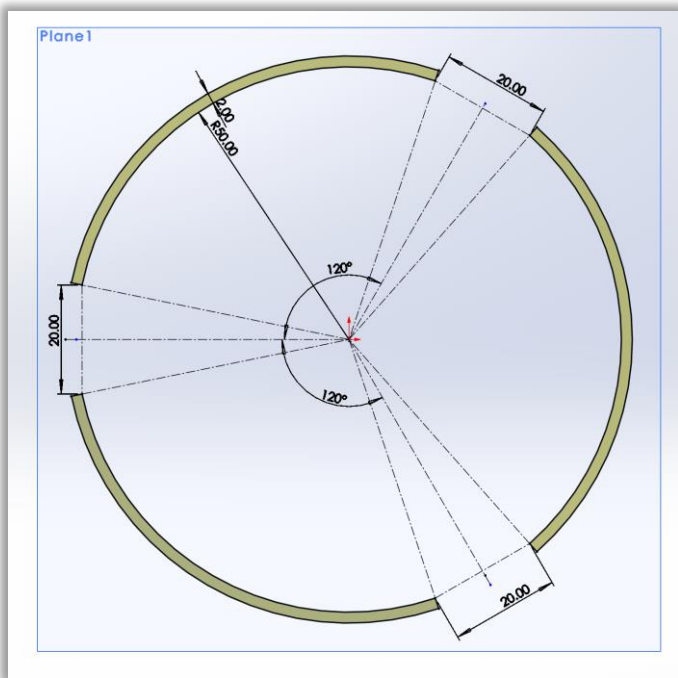
5. Draw a sketch like this in plane1



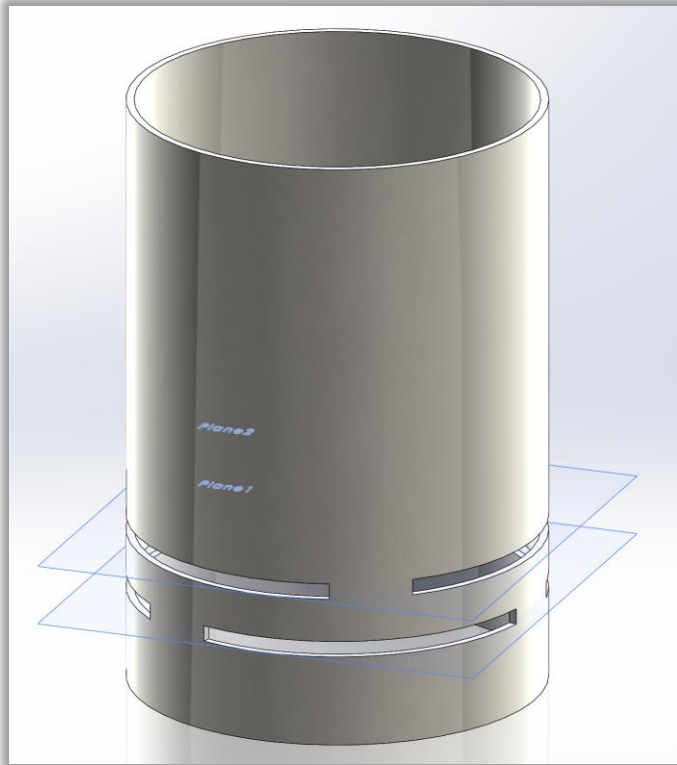
6. Use feature cut extrude 1mm in direction 1 & 1



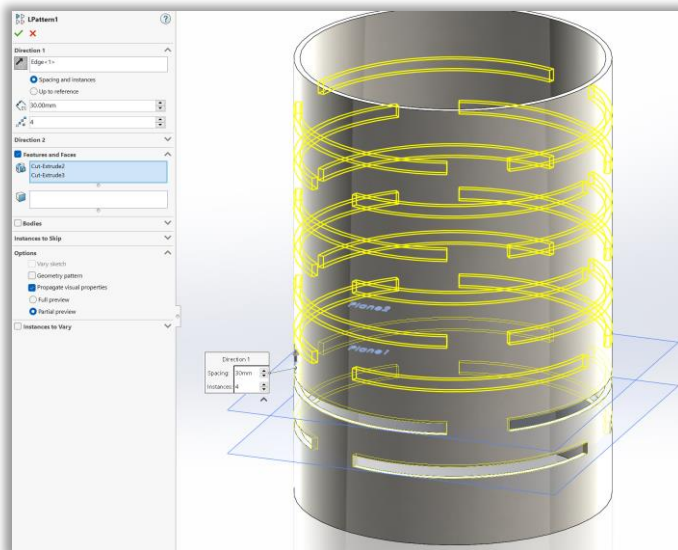
7. On plane2 draw sketch like this



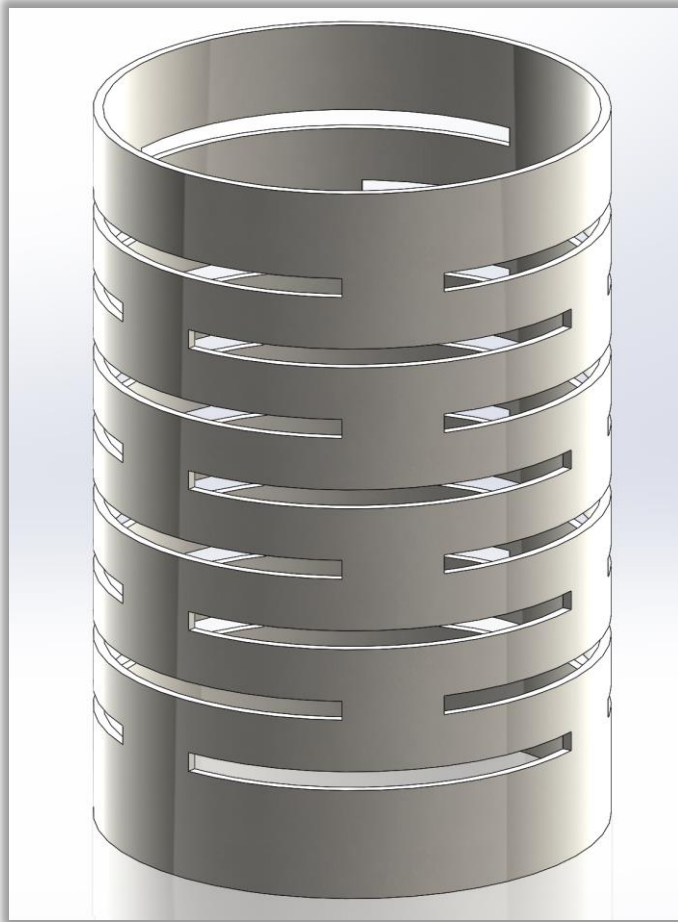
8. Extrude cut 1mm in direction1 &2



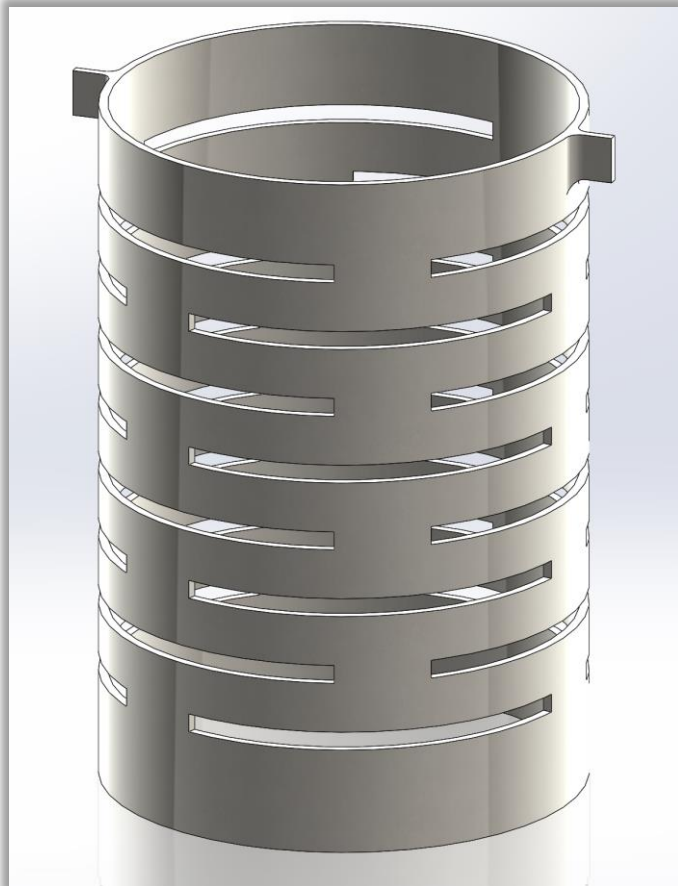
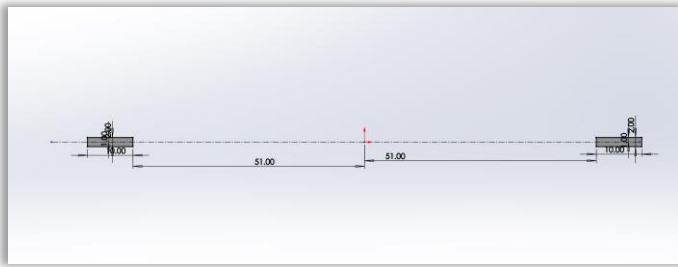
9. Use linear pattern feature



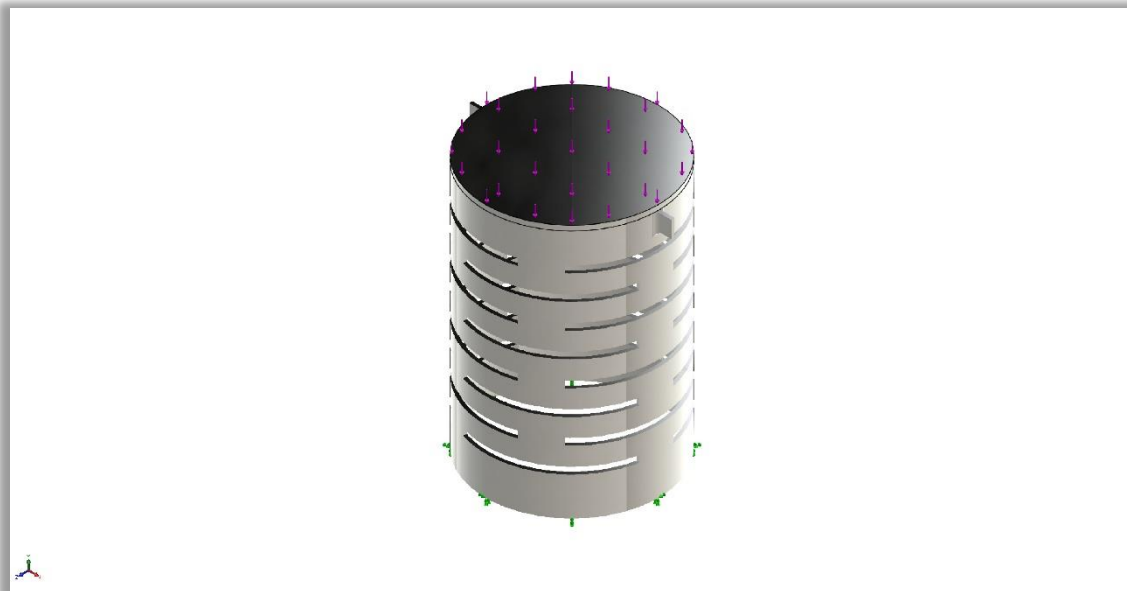
10. To get this



11. On the top surface draw a sketch like this and use extrude and fillet feature to get these



Model Information



Model name: Flexure part
Current Configuration: Default

Solid Bodies

Document Name and Reference	Treated As	Volumetric Properties	Document Path/Date Modified
Fillet1 	Solid Body	Mass:0.624099 kg Volume:8.00127e-05 m ³ Density:7,800 kg/m ³ Weight:6.11617 N	C:\Users\zulfi\Downloads\Flexure structure\FLEXURE STRUCTURE.SLDPRT Dec 4 16:04:22 2024
Boss-Extrude1 	Solid Body	Mass:0.19878 kg Volume:2.54846e-05 m ³ Density:7,800 kg/m ³ Weight:1.94804 N	C:\Users\zulfi\Downloads\Flexure structure\cover.SLDPRT Dec 4 15:39:34 2024



Study Properties

Study name	Compression
Analysis type	Static
Mesh type	Solid Mesh
Thermal Effect:	On
Thermal option	Include temperature loads
Zero strain temperature	298 Kelvin
Include fluid pressure effects from SOLIDWORKS Flow Simulation	Off
Solver type	Automatic
Inplane Effect:	Off
Soft Spring:	Off
Inertial Relief:	Off
Incompatible bonding options	Automatic
Large displacement	Off
Compute free body forces	On
Friction	Off
Use Adaptive Method:	Off
Result folder	SOLIDWORKS document (C:\Users\zulfi\Downloads\Flexure structure\)

Units

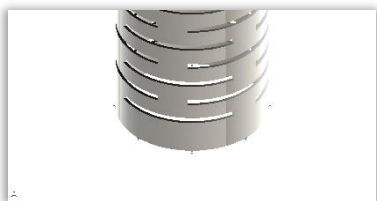
Unit system:	SI (MKS)
Length/Displacement	mm
Temperature	Kelvin
Angular velocity	Rad/sec
Pressure/Stress	N/mm ² (MPa)



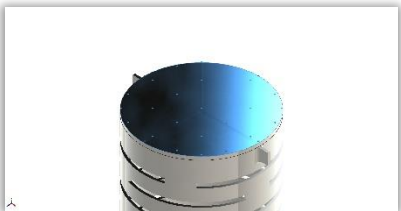
Material Properties

Model Reference	Properties	Components
	Name: Plain Carbon Steel Model type: Linear Elastic Isotropic Default failure criterion: Unknown Yield strength: 220.594 N/mm ² Tensile strength: 399.826 N/mm ² Elastic modulus: 210,000 N/mm ² Poisson's ratio: 0.28 Mass density: 7.8 g/cm ³ Shear modulus: 79,000 N/mm ² Thermal expansion coefficient: 1.3e-05 /Kelvin	SolidBody 1(Fillet1)(FLEXURE STRUCTURE-1), SolidBody 1(Boss-Extrude1)(cover-1)
Curve Data:N/A		

Loads and Fixtures

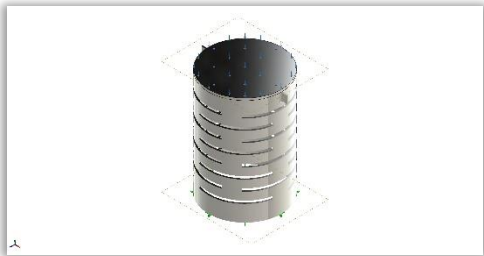
Fixture name	Fixture Image	Fixture Details
Fixed-1		Entities: 1 face(s) Type: Fixed Geometry

Resultant Forces				
Components	X	Y	Z	Resultant
Reaction force(N)	1.55568e-05	1,000	9.0301e-06	1,000
Reaction Moment(N.m)	0	0	0	0

Load name	Load Image	Load Details
Force-1		Entities: 1 face(s) Type: Apply normal force Value: 1,000 N



Interaction Information

Interaction	Interaction Image	Interaction Properties
Global Interaction		Type: Bonded Components: 1 component(s) Friction Value: 0.05 Options: Independent mesh

Mesh information

Mesh type	Solid Mesh
Mesher Used:	Blended curvature-based mesh
Jacobian points for High quality mesh	16 Points
Maximum element size	6.56899 mm
Minimum element size	2.18964 mm
Mesh Quality	High
Remesh failed parts independently	Off

Mesh information - Details

Total Nodes	19212
Total Elements	8451
Maximum Aspect Ratio	15.312
% of elements with Aspect Ratio < 3	58.7
Percentage of elements with Aspect Ratio > 10	0.0947
Percentage of distorted elements	0
Time to complete mesh(hh:mm:ss):	00:00:11
Computer name:	



Resultant Forces

Reaction forces

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N	1.55568e-05	1,000	9.0301e-06	1,000

Reaction Moments

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N.m	0	0	0	0

Free body forces

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N	-5.14984e-05	0.00200081	-0.000212669	0.00201274

Free body moments

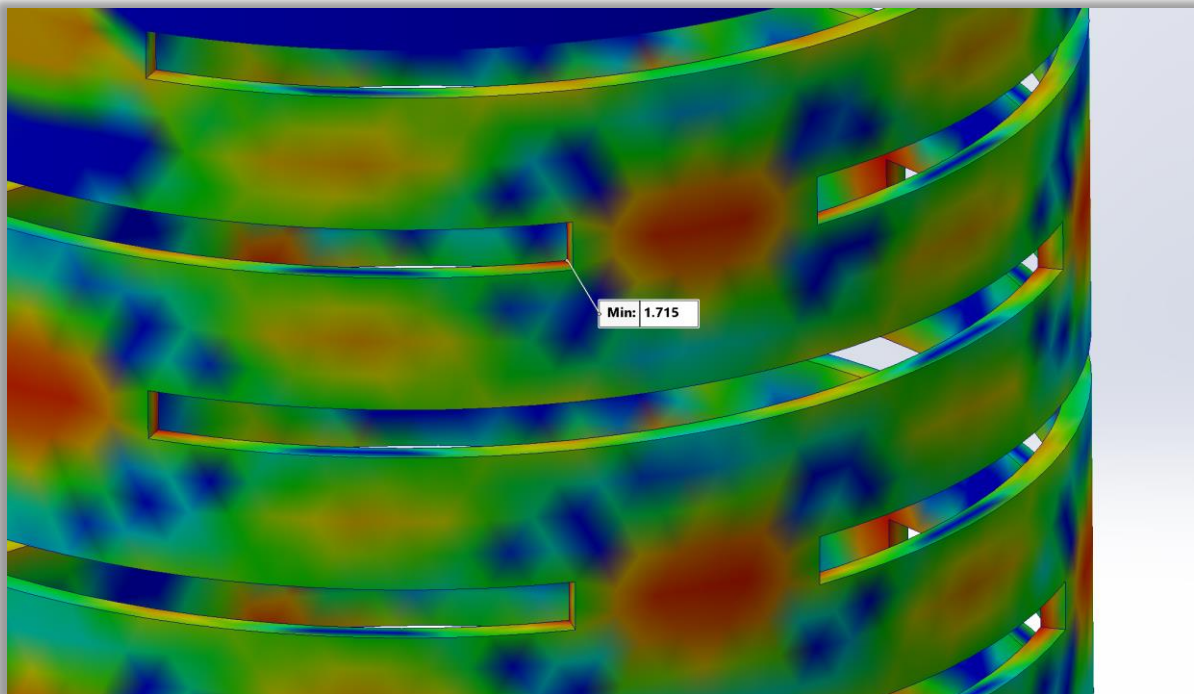
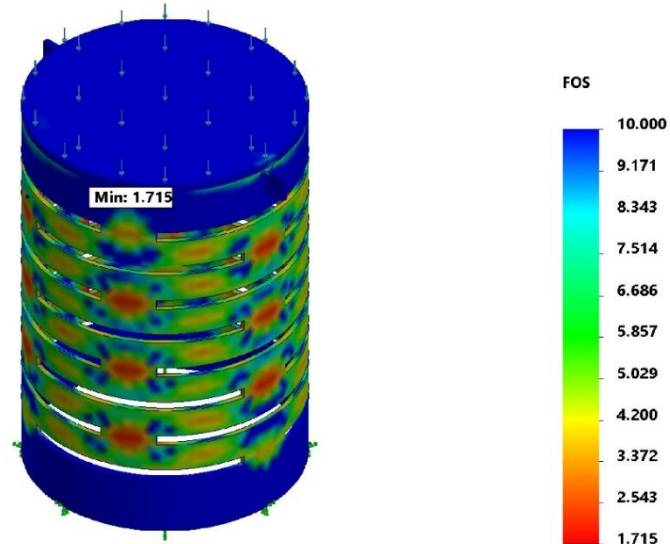
Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N.m	0	0	0	1e-33



Study Results (Compression)

Name	Type	Min	Max
Factor of Safety1	Automatic	1.715 Node: 201	4,189.932 Node: 2283

Model name: Flexure part
Study name: Compression(- Default-)
Plot type: Factor of Safety Factor of Safety1
Criterion : Automatic
Factor of safety distribution: Min FOS = 1.7

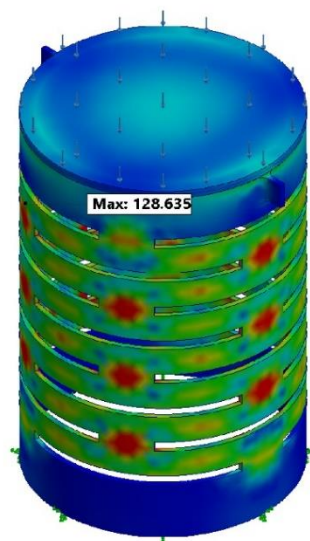


Flexure part-Compression-Factor of Safety-Factor of Safety1

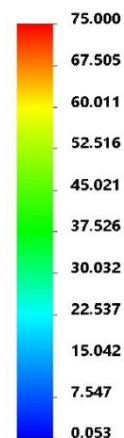


Name	Type	Min	Max
Stress1	VON: von Mises Stress	0.053N/mm ² (MPa) Node: 2283	128.635N/mm ² (MPa) Node: 201

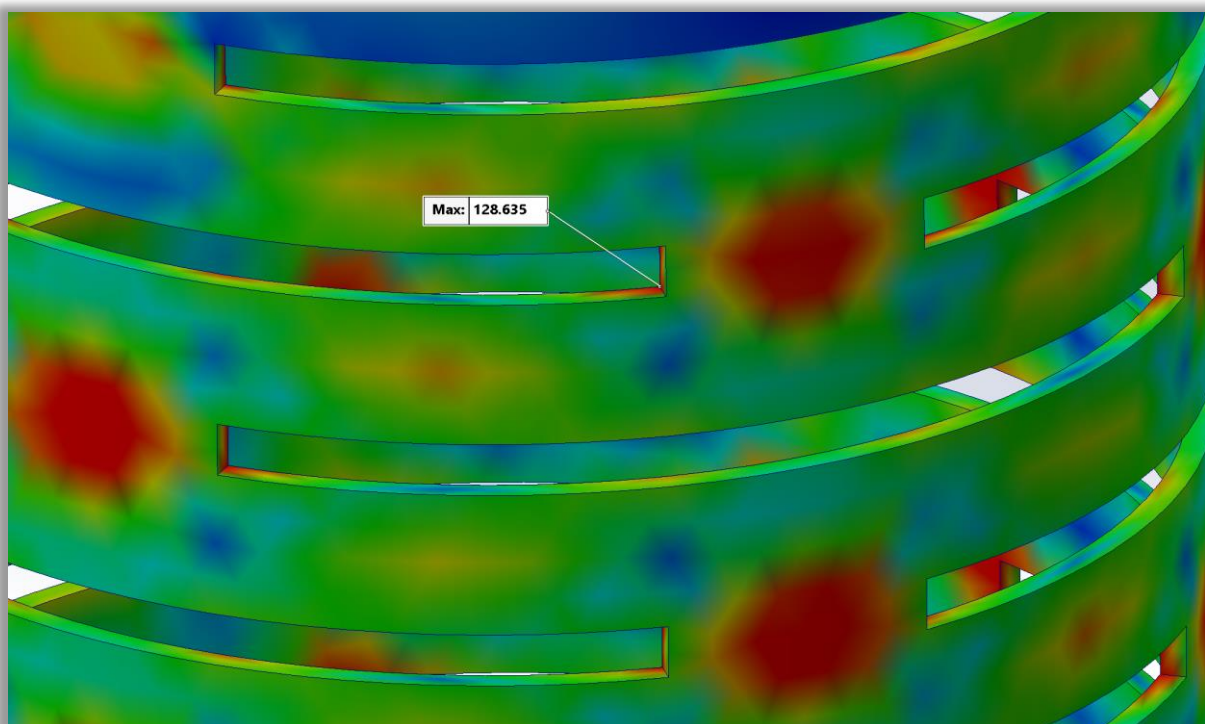
Model name: Flexure part
Study name: Compression(-Default-)
Plot type: Static nodal stress Stress1



von Mises (N/mm² (MPa))



→ Yield strength: 220.594

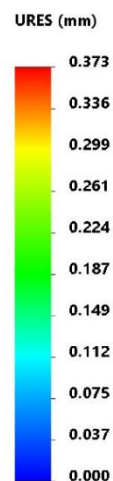
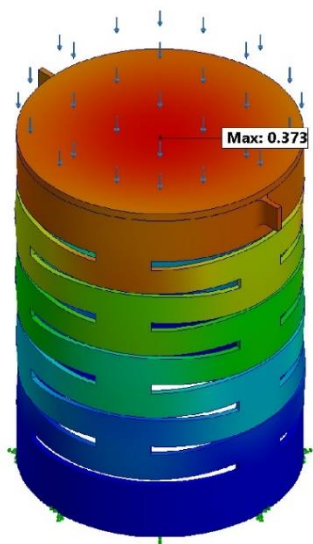


Flexure part-Compression-Stress-Stress1



Name	Type	Min	Max
Displacement1	URES: Resultant Displacement	0.000mm Node: 16	0.373mm Node: 18464

Model name: Flexure part
Study name: Compression(-Default-)
Plot type: Static displacement Displacement1
Deformation scale: 30

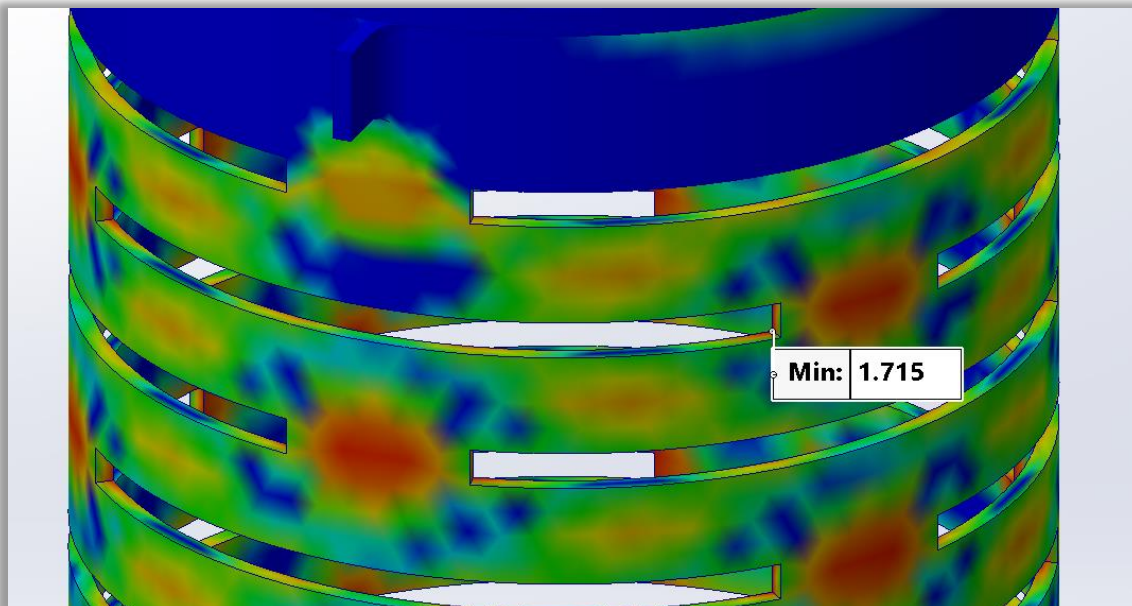
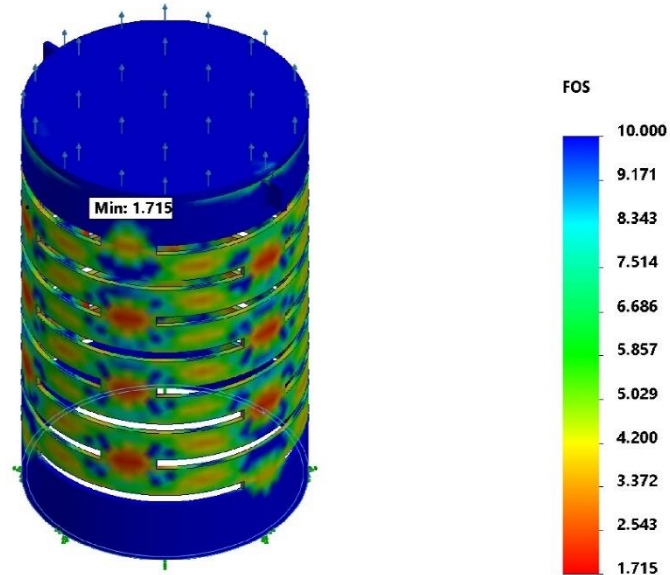


Flexure part-Compression-Displacement-Displacement1

Study Results (Tension)

Name	Type	Min	Max
Factor of Safety1	Automatic	1.715 Node: 201	4,189.932 Node: 2283

Model name: Flexure part
Study name: Tension(-Default-)
Plot type: Factor of Safety Factor of Safety1
Criterion : Automatic
Factor of safety distribution: Min FOS = 1.7



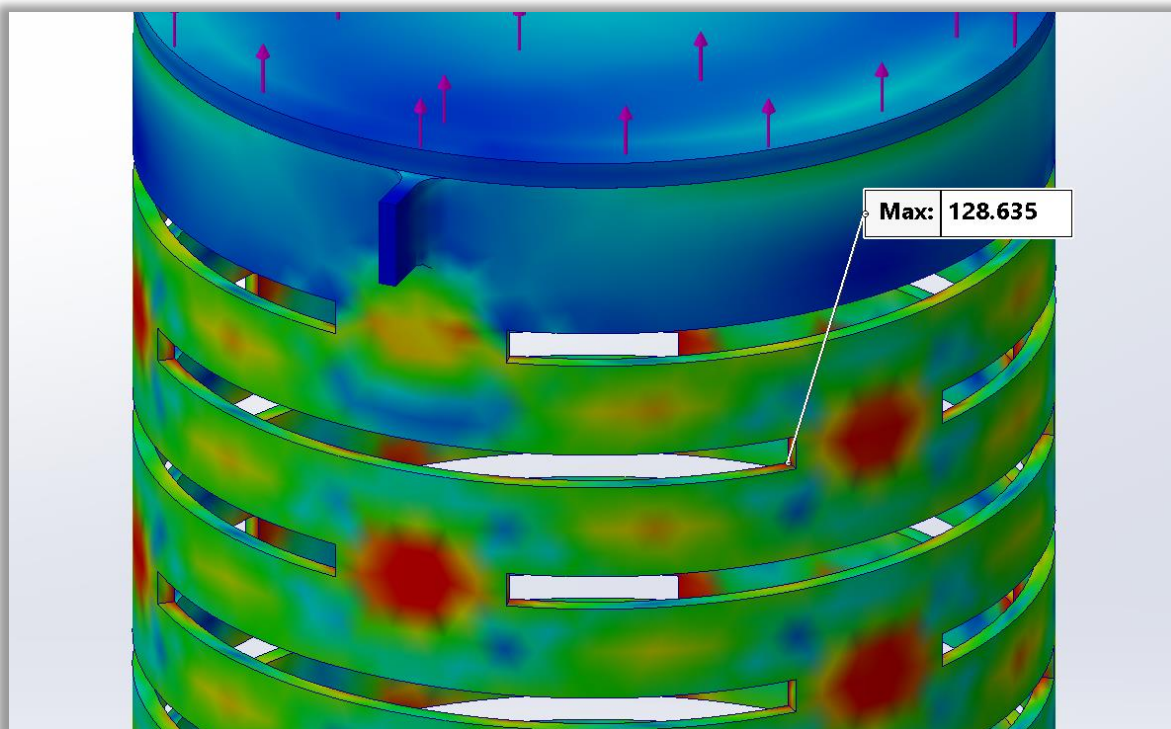
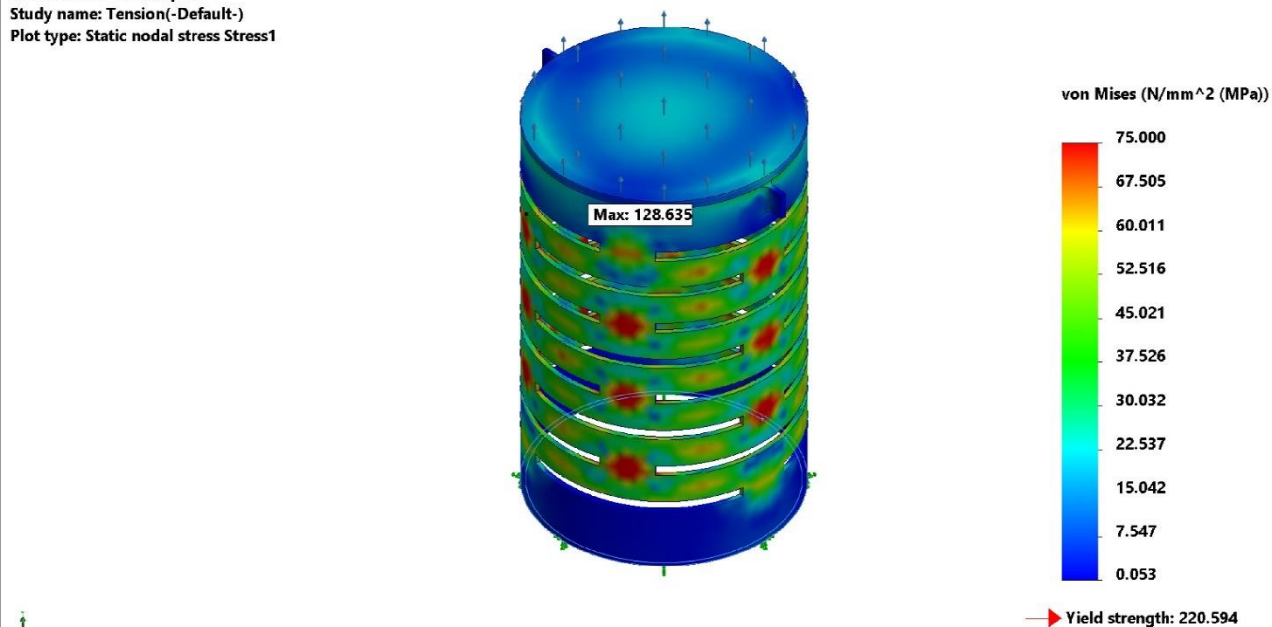
Tension-Factor of Safety-Factor of Safety1

Flexure part-



Name	Type	Min	Max
Stress1	VON: von Mises Stress	0.053N/mm ² (MPa) Node: 2283	128.635N/mm ² (MPa) Node: 201

Model name: Flexure part
Study name: Tension(-Default-)
Plot type: Static nodal stress Stress1

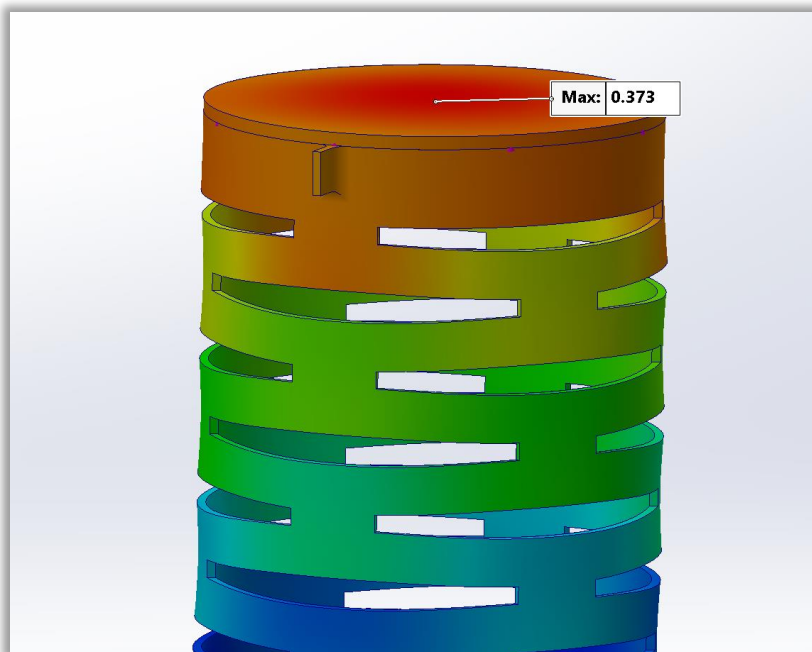
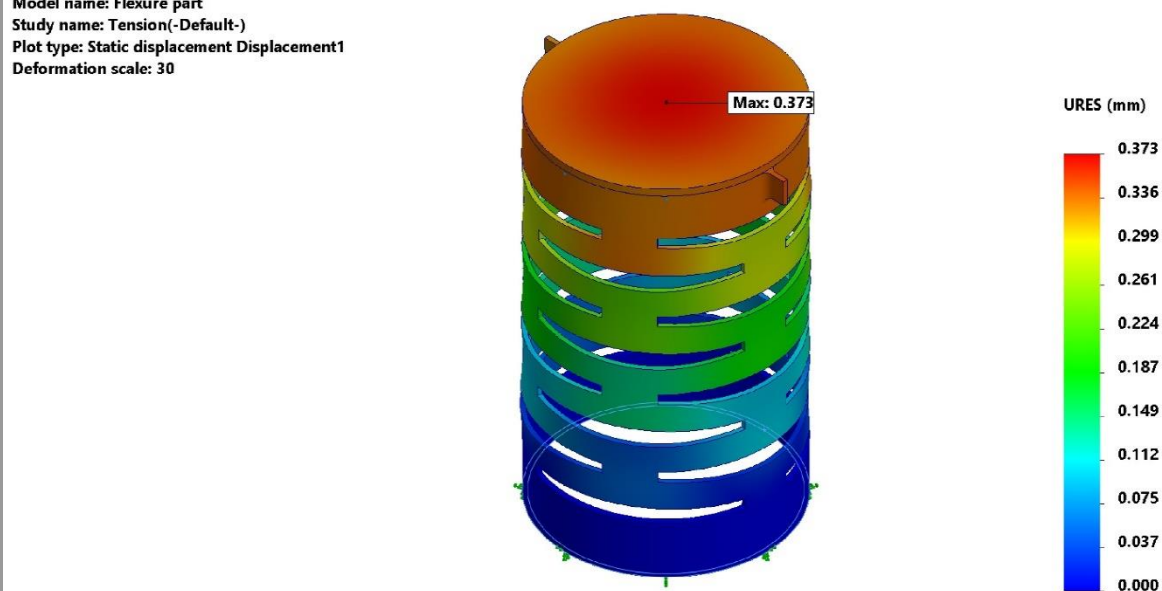


Flexure part-Tension-Stress-Stress1



Name	Type	Min	Max
Displacement1	URES: Resultant Displacement	0.000mm Node: 16	0.373mm Node: 18464

Model name: Flexure part
Study name: Tension(-Default-)
Plot type: Static displacement Displacement1
Deformation scale: 30

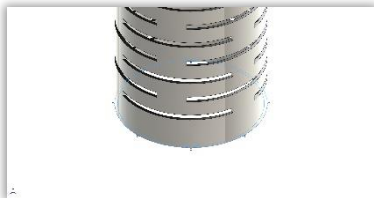


Flexure part-Tension-Displacement-Displacement1

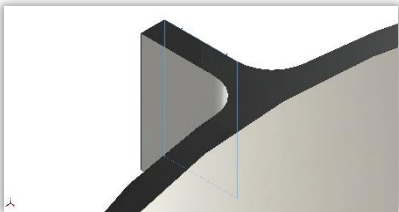
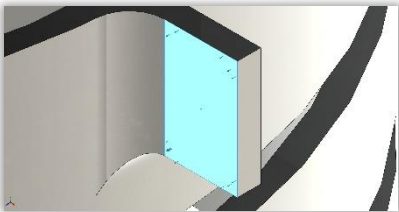


Study Results (Tension)

Loads and Fixtures

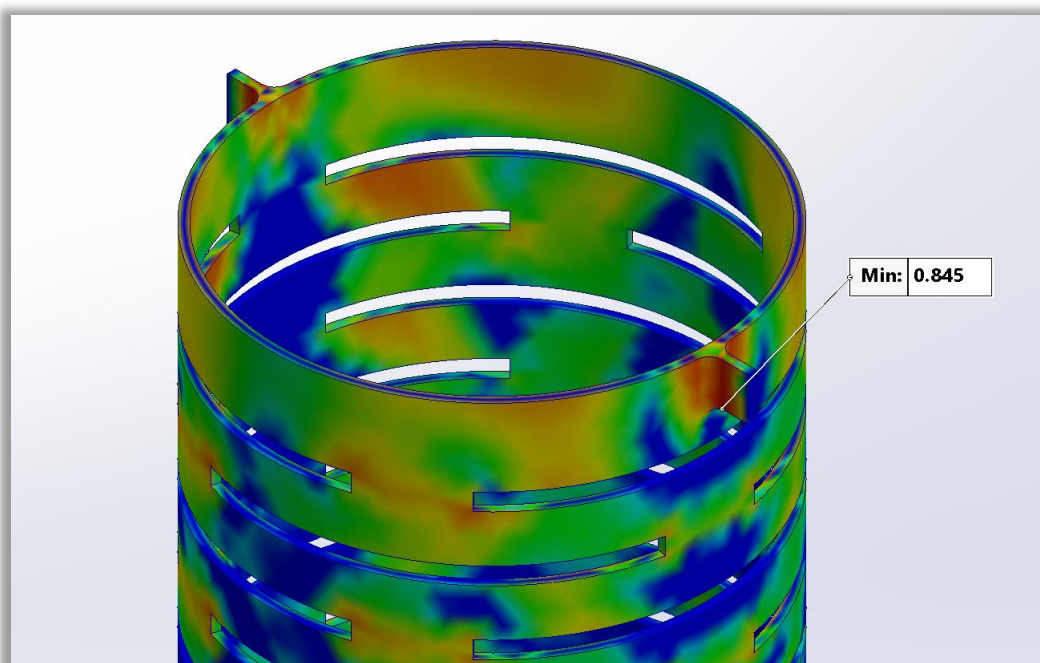
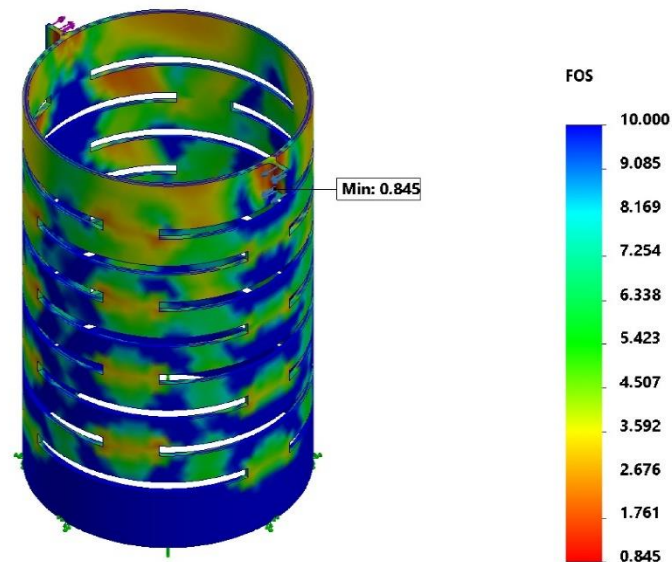
Fixture name	Fixture Image	Fixture Details
Fixed-1		Entities: 1 face(s) Type: Fixed Geometry

Resultant Forces				
Components	X	Y	Z	Resultant
Reaction force(N)	-4.05312e-06	-4.55976e-06	-1.7643e-05	1.8668e-05
Reaction Moment(N.m)	0	0	0	0

Load name	Load Image	Load Details		
Force-1		Entities:	1 face(s)	
		Type:	Apply normal force	
		Value:	-500 N	
Force-2		Entities:	1 face(s)	
		Type:	Apply normal force	
		Value:	-500 N	

Name	Type	Min	Max
Factor of Safety1	Automatic	0.845 Node: 251	5,068.863 Node: 11916

Model name: Flexure part
Study name: Torsion(-Default-)
Plot type: Factor of Safety Factor of Safety1
Criterion : Automatic
Factor of safety distribution: Min FOS = 0.85

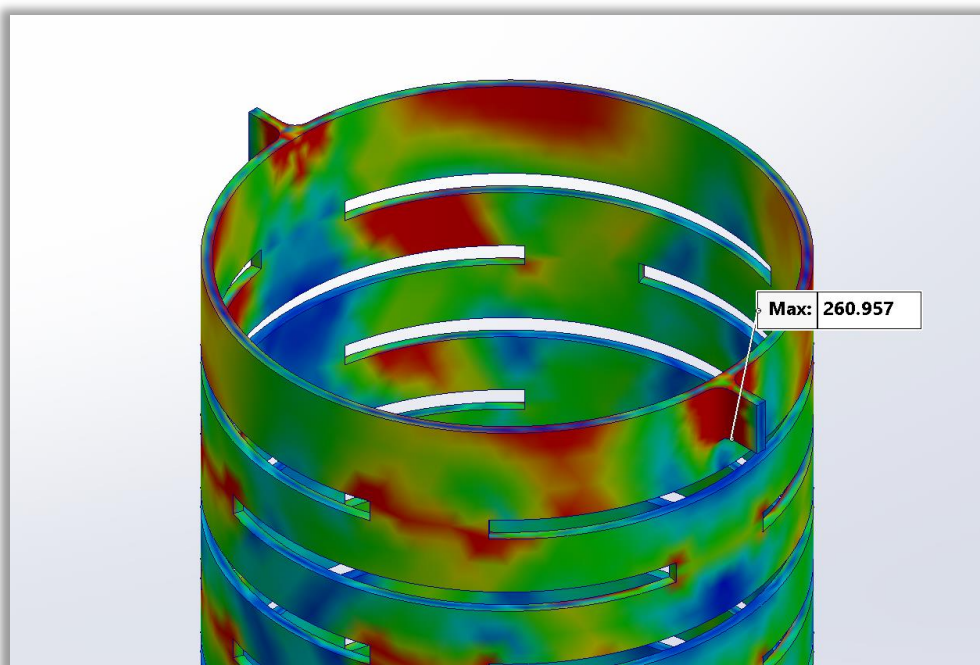
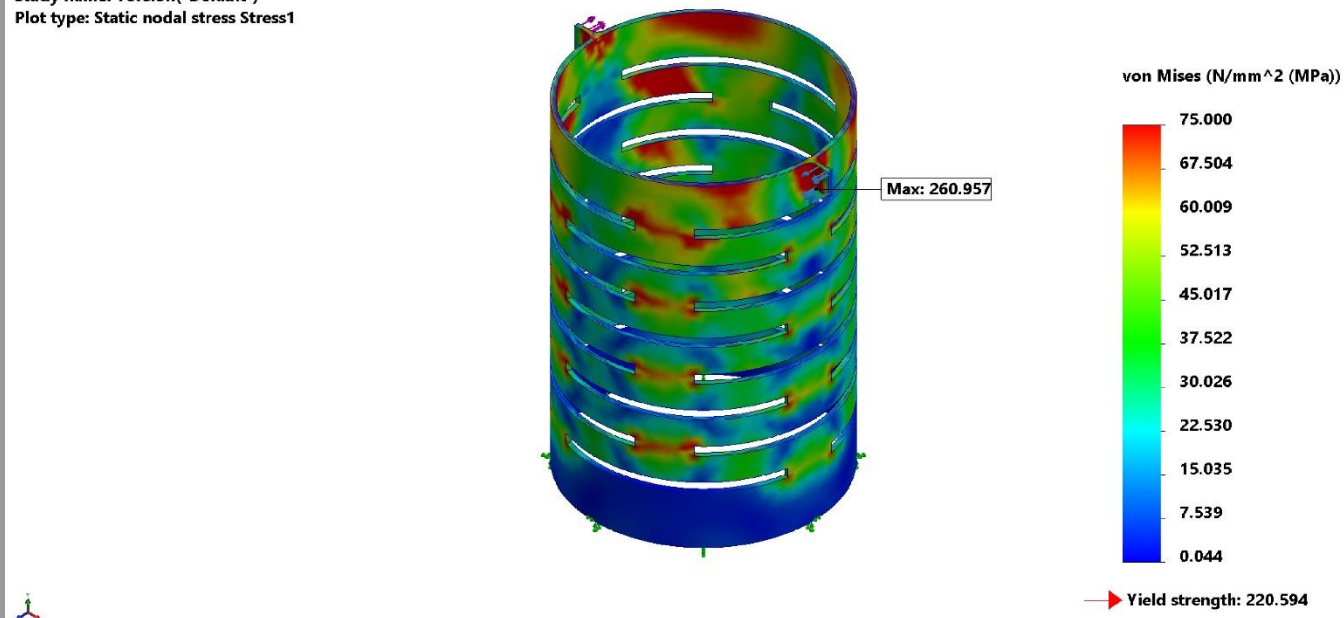


Flexure part-Torsion-Factor of Safety-Factor of Safety1



Name	Type	Min	Max
Stress1	VON: von Mises Stress	0.044N/mm ² (MPa) Node: 11916	260.957N/mm ² (MPa) Node: 251

Model name: Flexure part
Study name: Torsion(-Default-)
Plot type: Static nodal stress Stress1

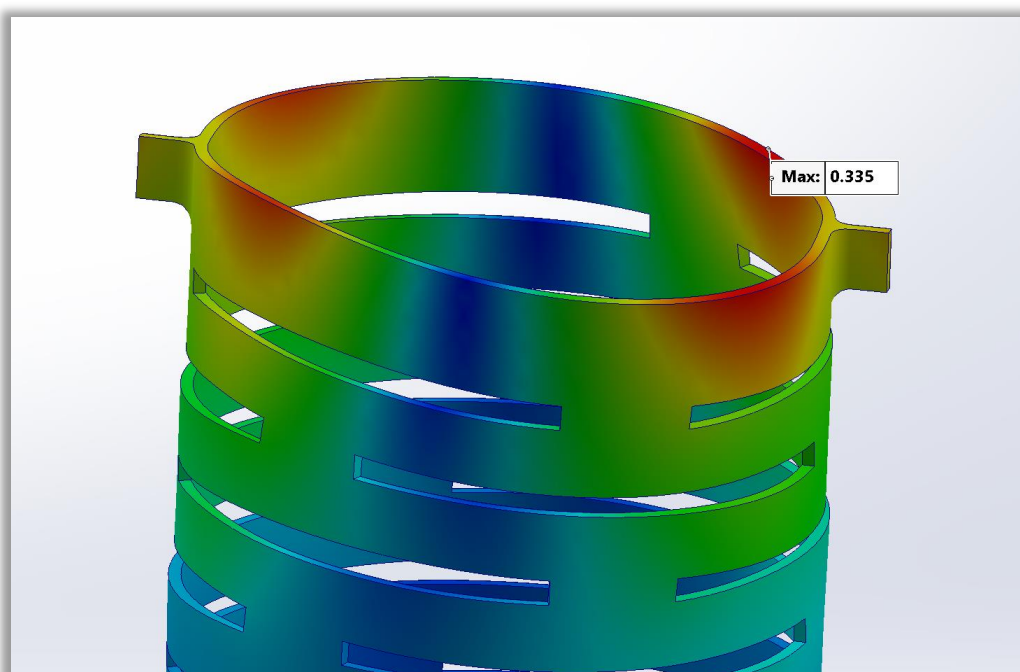
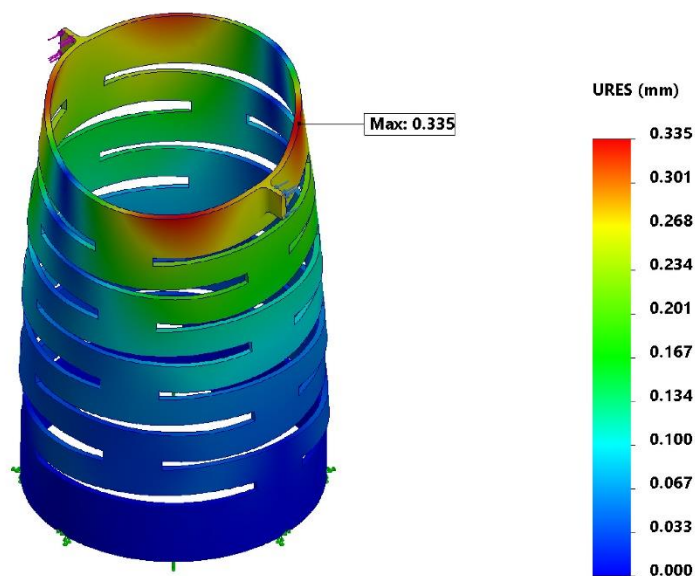


Flexure part-Torsion-Stress-Stress1



Name	Type	Min	Max
Displacement1	URES: Resultant Displacement	0.000mm Node: 16	0.335mm Node: 296

Model name: Flexure part
Study name: Torsion(-Default-)
Plot type: Static displacement Displacement1
Deformation scale: 30



Flexure part-Torsion-Displacement-Displacement1



Conclusion

As shown above, the simulations depict the model's behavior under various types of stress. The material chosen is plain carbon steel.

