High carbon steel Top Plate Analysis Report

Analyzed File:	topPlate.ipt
Autodesk Inventor Version:	2020 (Build 240168000, 168)
Creation Date:	7/30/2021, 10:46 AM
Study Author:	Bisqwit2.0
Summary:	

Project Info (iProperties)

Summary

Author	joelm

Project

Part Number	topPlate
Designer	joelm
Cost	$0.00
Date Created	6/13/2021

Status

Design Status	WorkInProgress

Physical

Material	Steel, Carbon
Density	7.85 g/cm^3
Mass	1.36832 kg
Area	31562.6 mm^2
Volume	174308 mm^3
Center of Gravity	x=0 mm y=10.329 mm z=-41 mm

Note: Physical values could be different from Physical values used by FEA reported below.

Static Analysis:1

General objective and settings:

Design Objective	Single Point
Study Type	Static Analysis
Last Modification Date	7/30/2021, 10:32 AM
Detect and Eliminate Rigid Body Modes	No

Mesh settings:

Avg. Element Size (fraction of model diameter)	0.1
Min. Element Size (fraction of avg. size)	0.2
Grading Factor	1.5
Max. Turn Angle	60 deg

Create Curved Mesh Elements	Yes

Material(s)

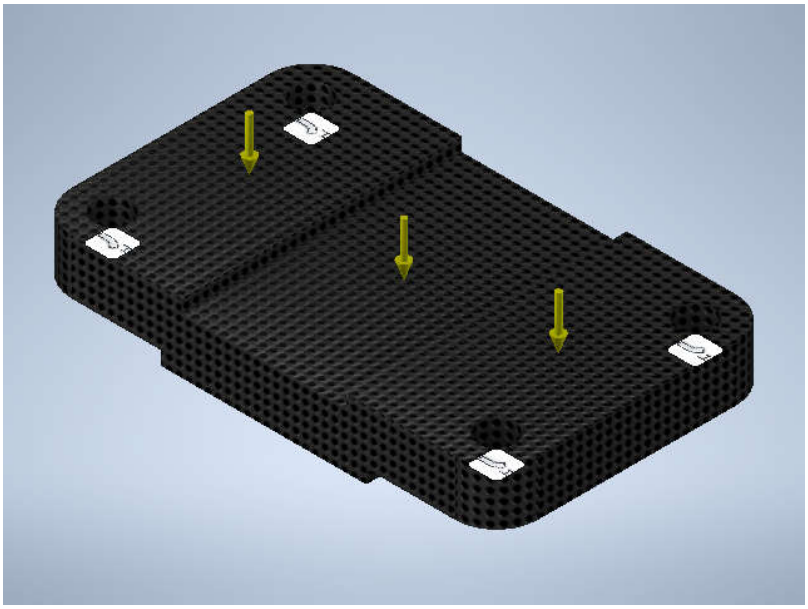
Name	Steel, Carbon	
General	Mass Density	7.85 g/cm^3
	Yield Strength	350 MPa
	Ultimate Tensile Strength	420 MPa
Stress	Young's Modulus	200 GPa
	Poisson's Ratio	0.29 ul
	Shear Modulus	77.5194 GPa
Part Name(s)	topPlate.ipt	

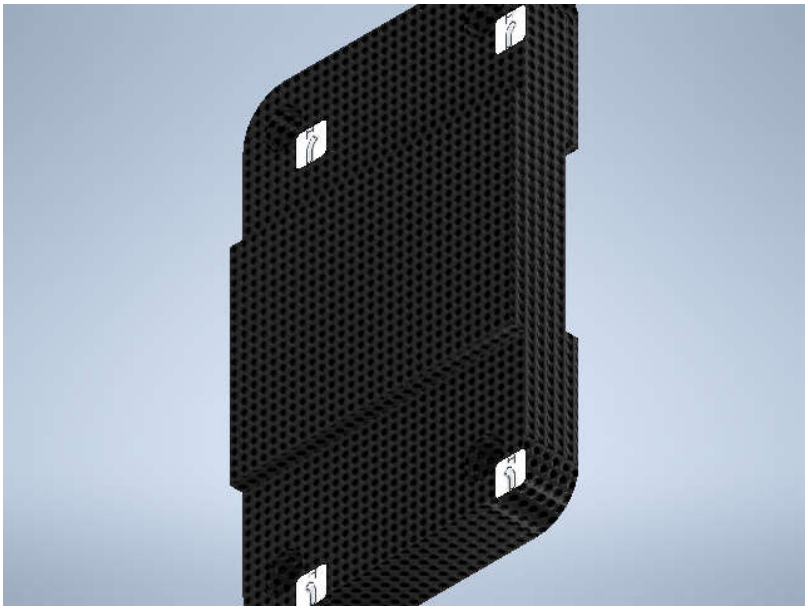
Operating conditions

Gravity

Load Type	Gravity
Magnitude	9810.000 mm/s^2
Vector X	0.000 mm/s^2
Vector Y	-9810.000 mm/s^2
Vector Z	0.000 mm/s^2

Selected Face(s)

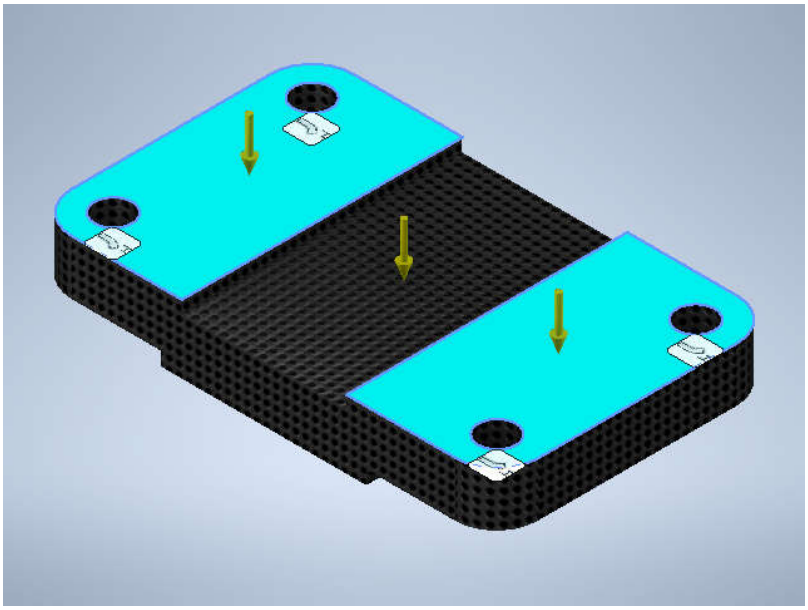


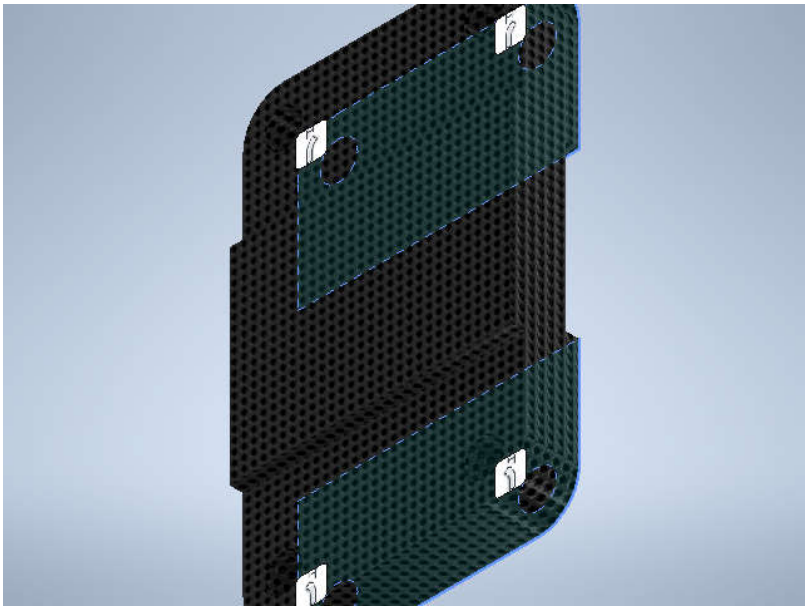


⊟ Force:1

Load Type	Force
Magnitude	100000.000 N
Vector X	0.000 N
Vector Y	-100000.000 N
Vector Z	0.000 N

⊟ Selected Face(s)

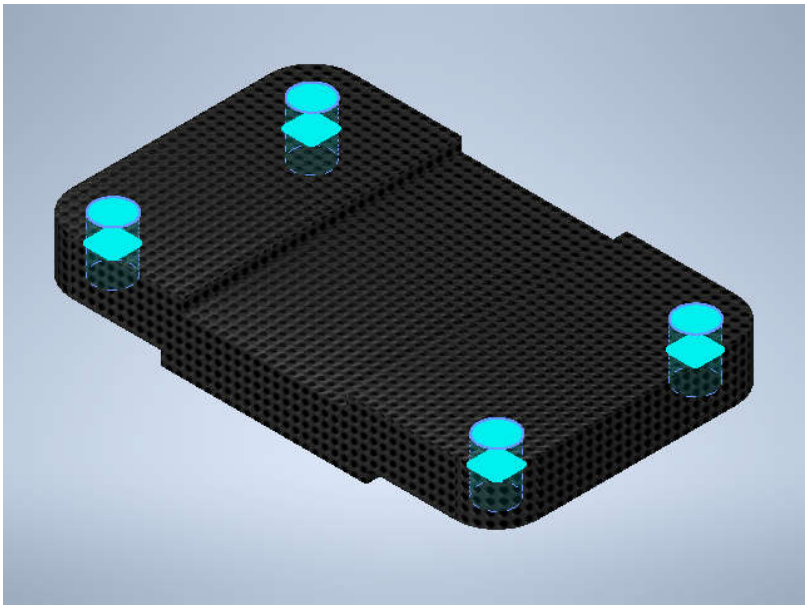


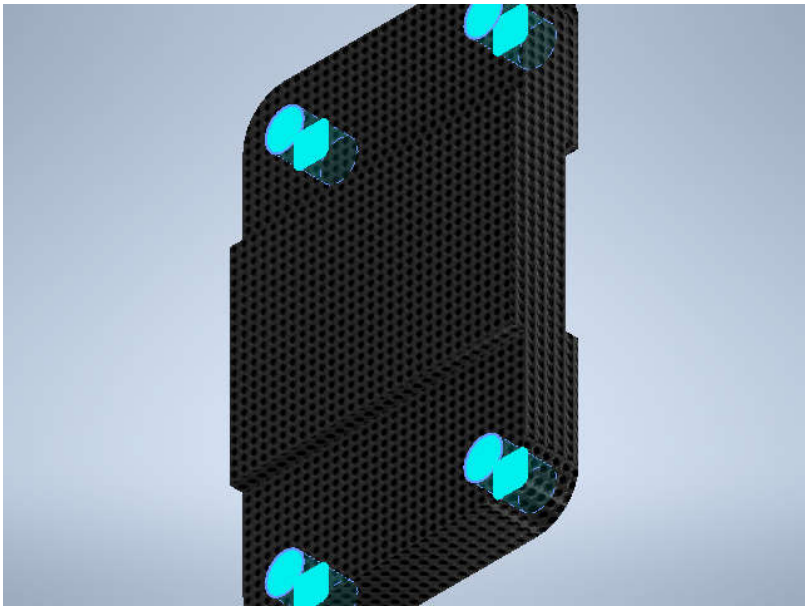


Fixed Constraint:1

Constraint Type	Fixed Constraint

Selected Face(s)





Results

Reaction Force and Moment on Constraints

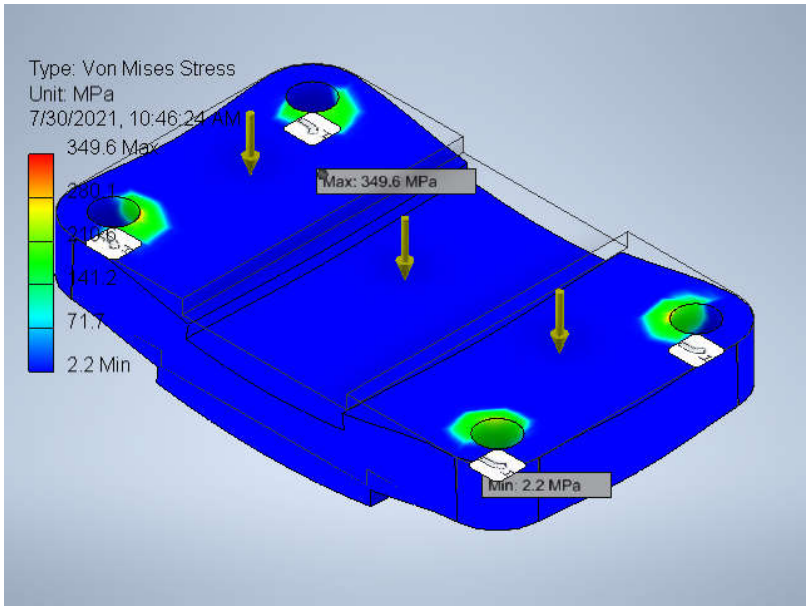
Constraint Name	Reaction Force		Reaction Moment	
	Magnitude	Component (X,Y,Z)	Magnitude	Component (X,Y,Z)
Fixed Constraint:1	100013 N	0 N	0 N m	0 N m
		100013 N		0 N m
		0 N		0 N m

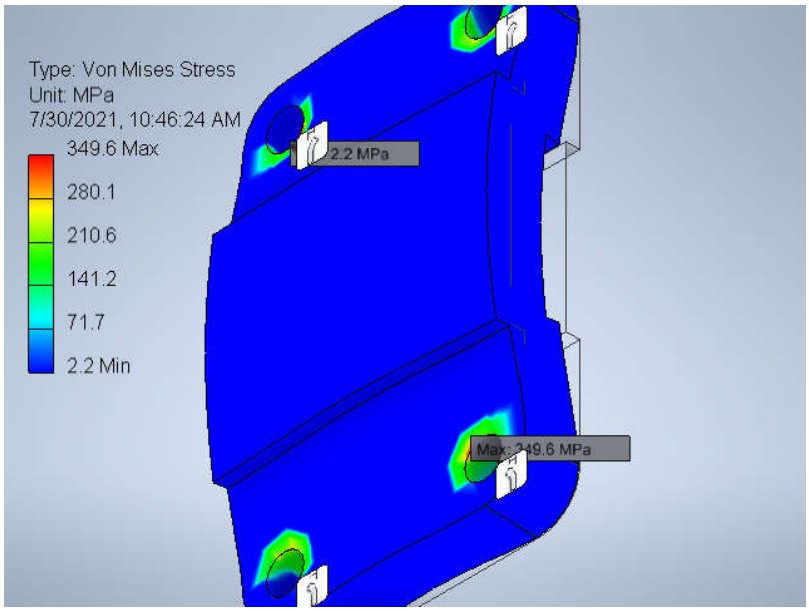
Result Summary

Name	Minimum	Maximum
Volume	174308 mm^3	
Mass	1.36832 kg	
Von Mises Stress	2.22185 MPa	349.571 MPa
1st Principal Stress	-114.476 MPa	399.296 MPa
3rd Principal Stress	-490.523 MPa	80.1116 MPa
Displacement	0 mm	0.0315892 mm
Safety Factor	1.00123 ul	15 ul
Stress XX	-414.704 MPa	310.594 MPa
Stress XY	-131.753 MPa	131.232 MPa
Stress XZ	-122.394 MPa	103.864 MPa
Stress YY	-175.45 MPa	139.406 MPa
Stress YZ	-94.1128 MPa	103.029 MPa
Stress ZZ	-279.711 MPa	220.076 MPa
X Displacement	-0.00670724 mm	0.00673476 mm
Y Displacement	-0.0315891 mm	0.000203997 mm
Z Displacement	-0.00261617 mm	0.00257046 mm
Equivalent Strain	0.0000106105 ul	0.00169009 ul
1st Principal Strain	-0.00000816253 ul	0.00167629 ul
3rd Principal Strain	-0.00203222 ul	-0.00000681039 ul
Strain XX	-0.00154319 ul	0.00119788 ul
Strain XY	-0.000849808 ul	0.000846448 ul
Strain XZ	-0.000789439 ul	0.000669924 ul
Strain YY	-0.000386445 ul	0.000471023 ul
Strain YZ	-0.000607028 ul	0.000664539 ul
Strain ZZ	-0.000999477 ul	0.000840867 ul

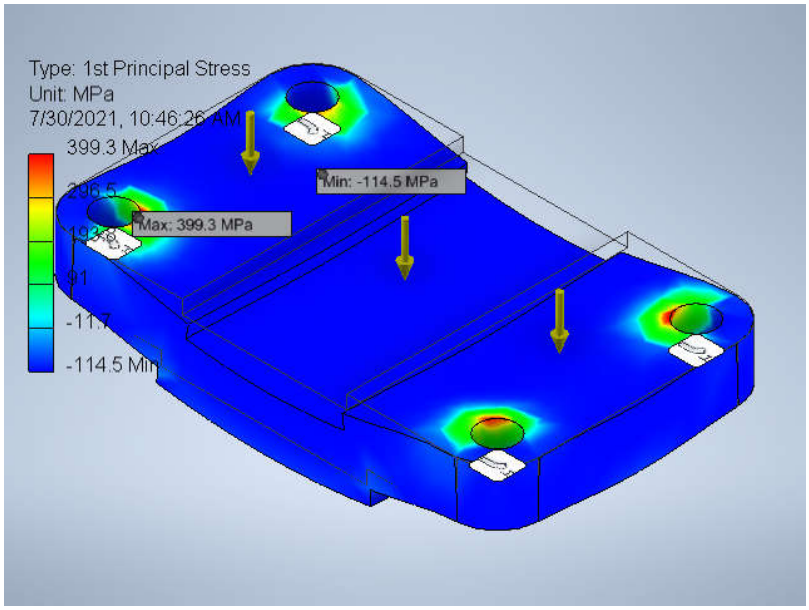
Figures

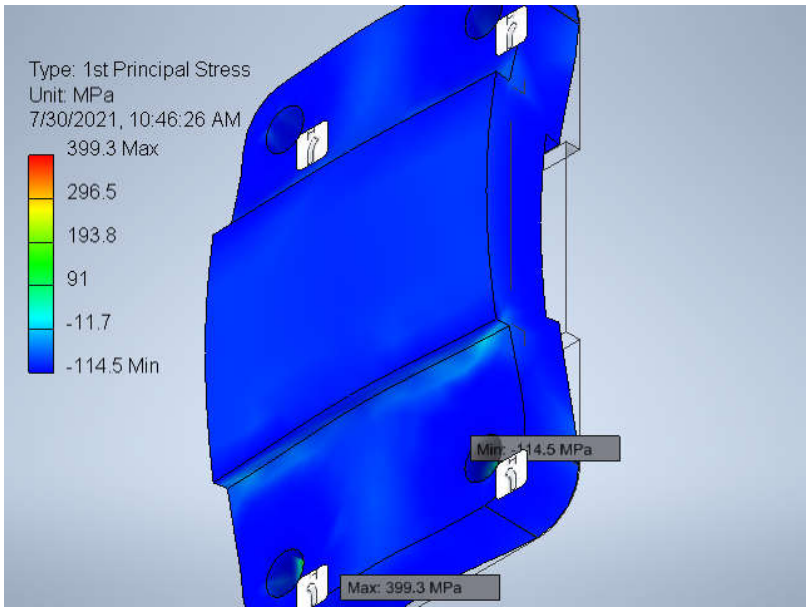
Von Mises Stress



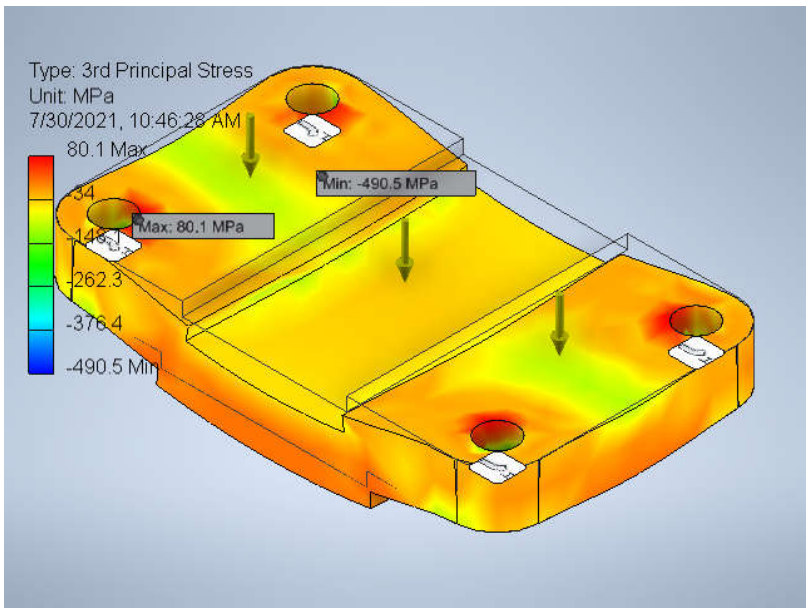


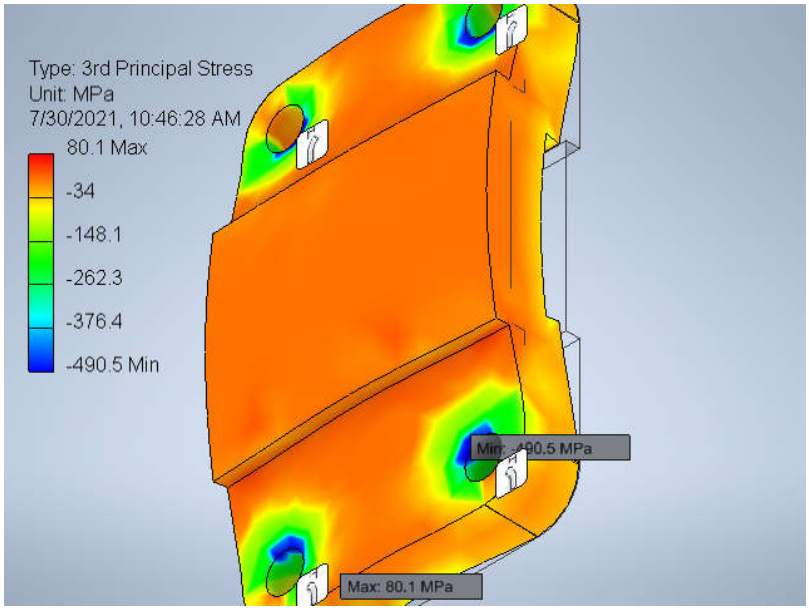
1st Principal Stress



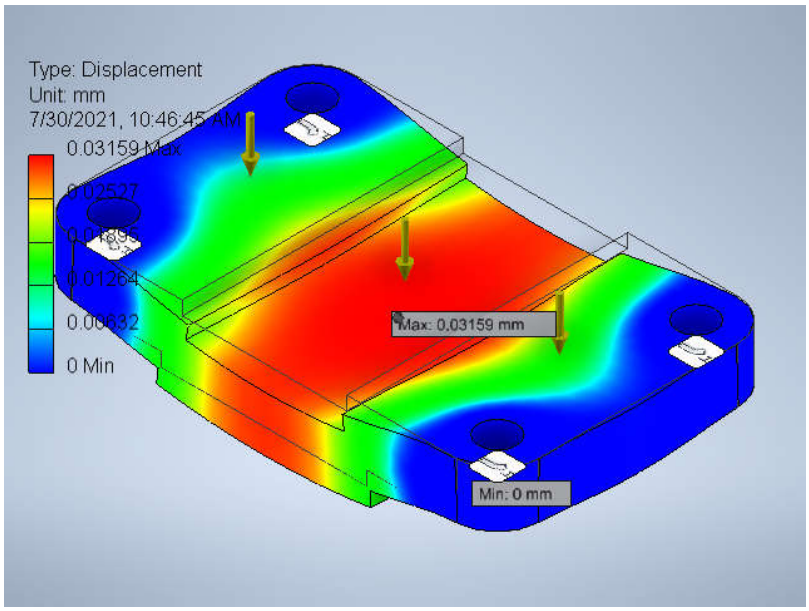


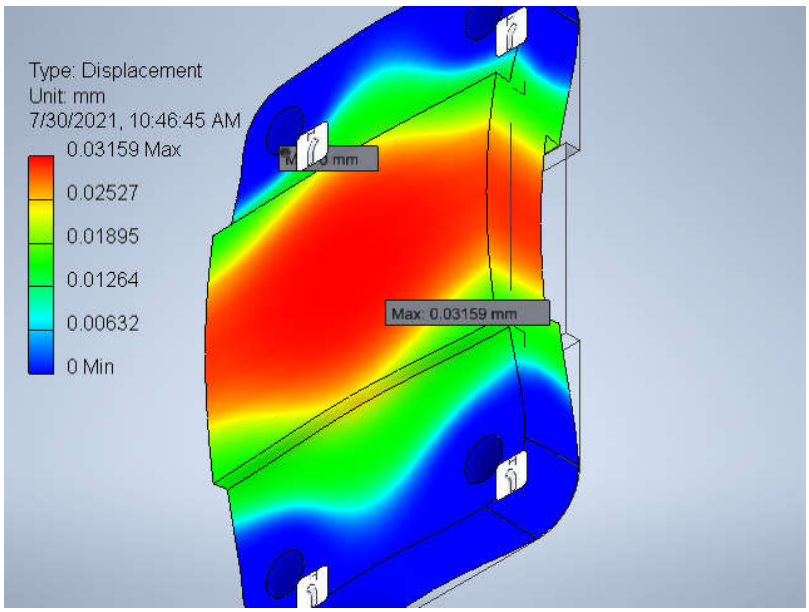
⊟ 3rd Principal Stress



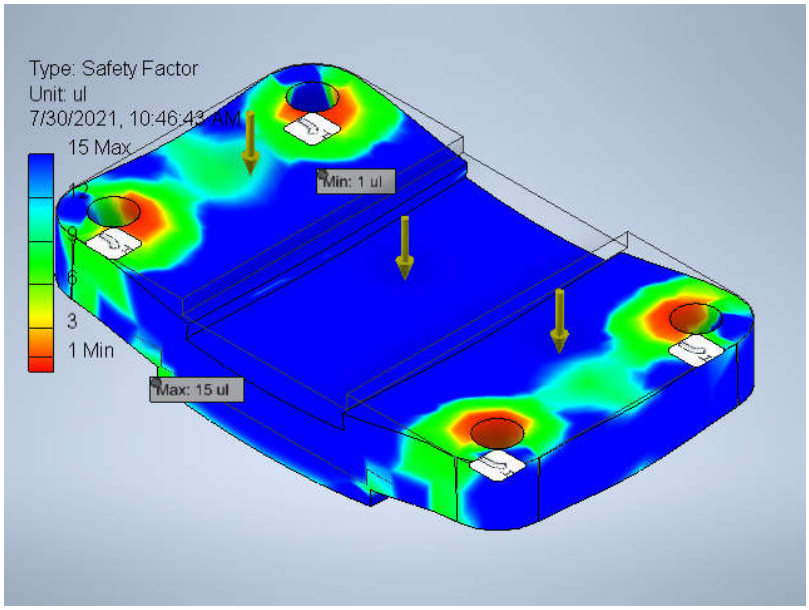


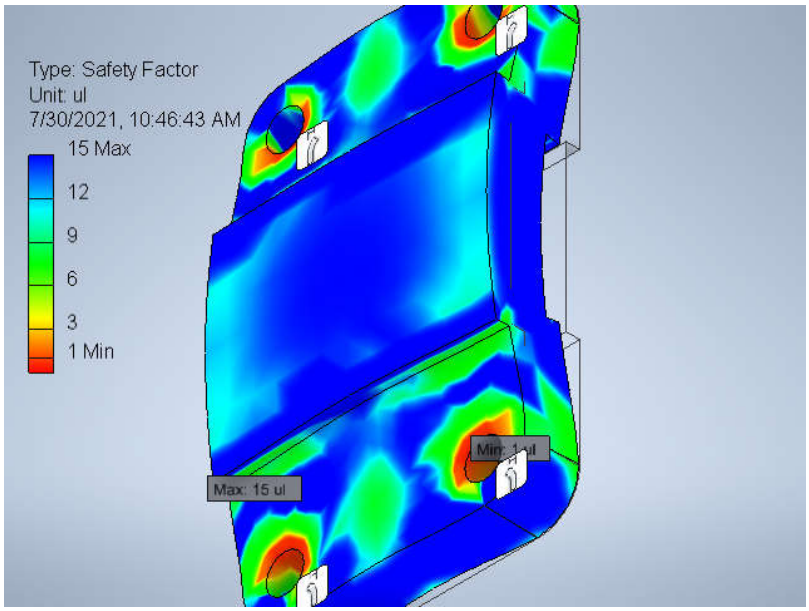
Displacement



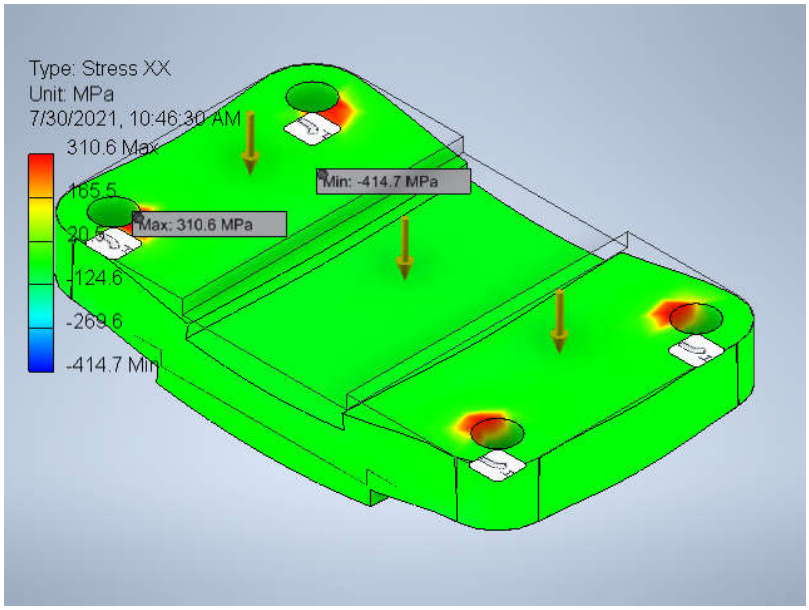


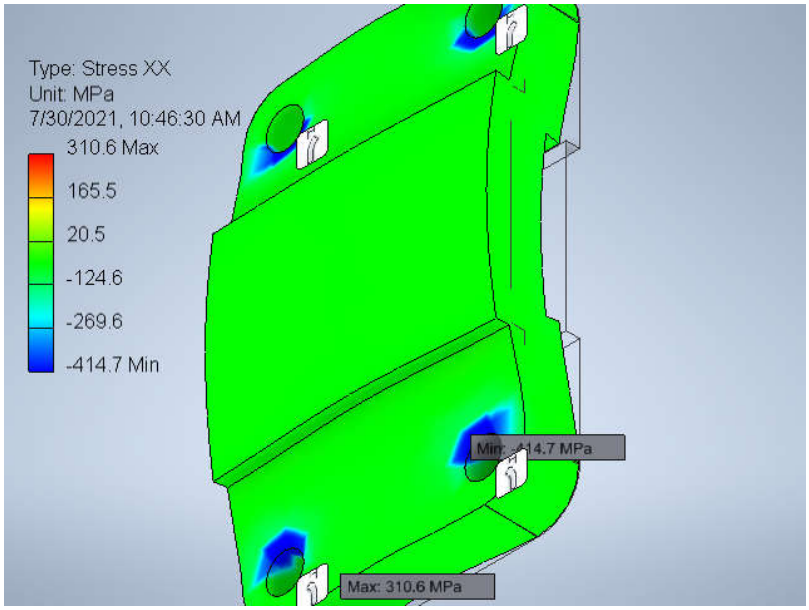
Safety Factor





Stress XX

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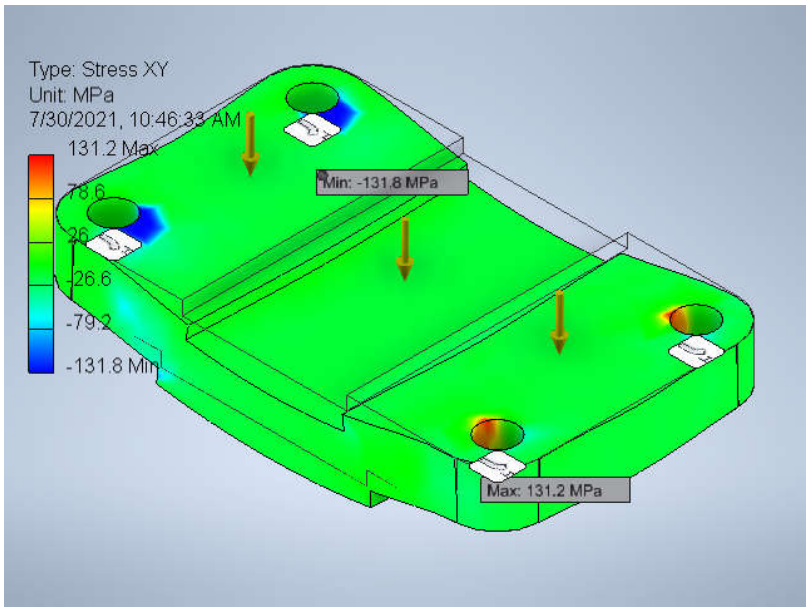
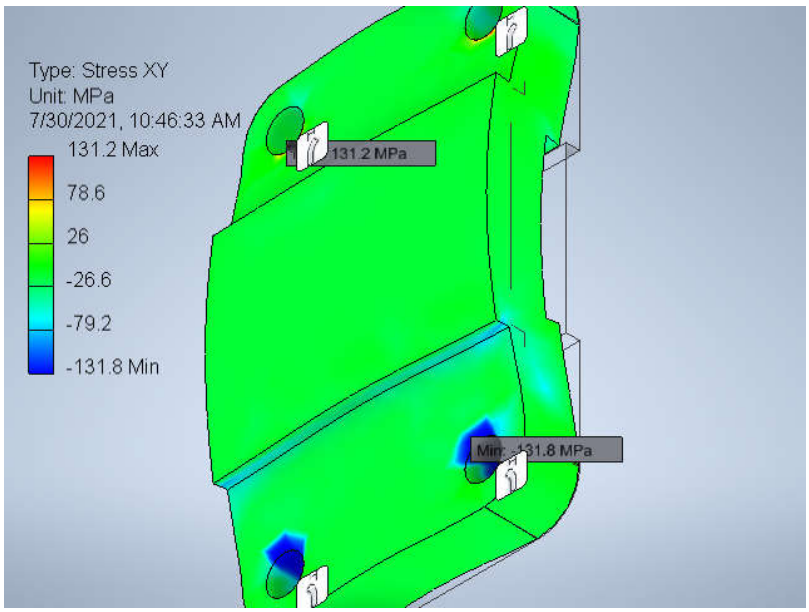
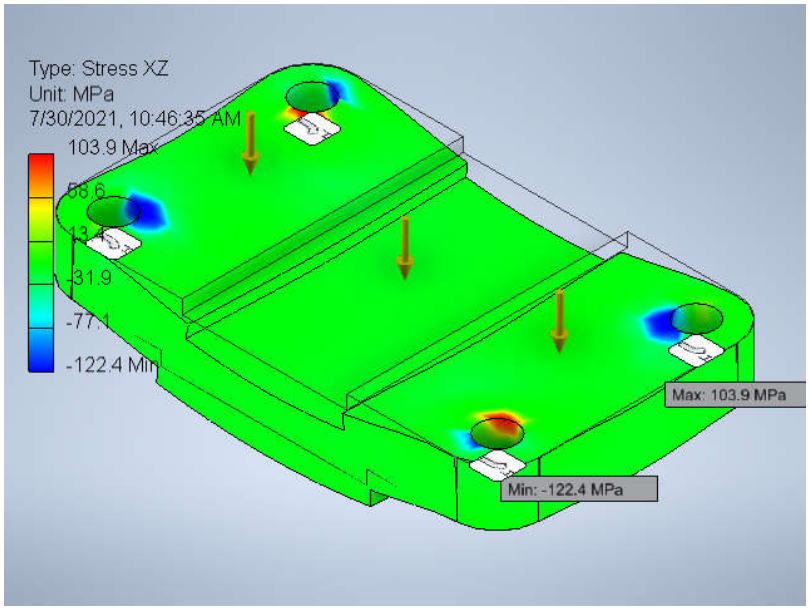
Unit: MPa
7/30/2021, 10:46:30 AM
310.6 Max
165.5
20.5
-124.6
-269.6
-414.7 Min
Min: -414.7 MPa
Max: 310.6 MPa

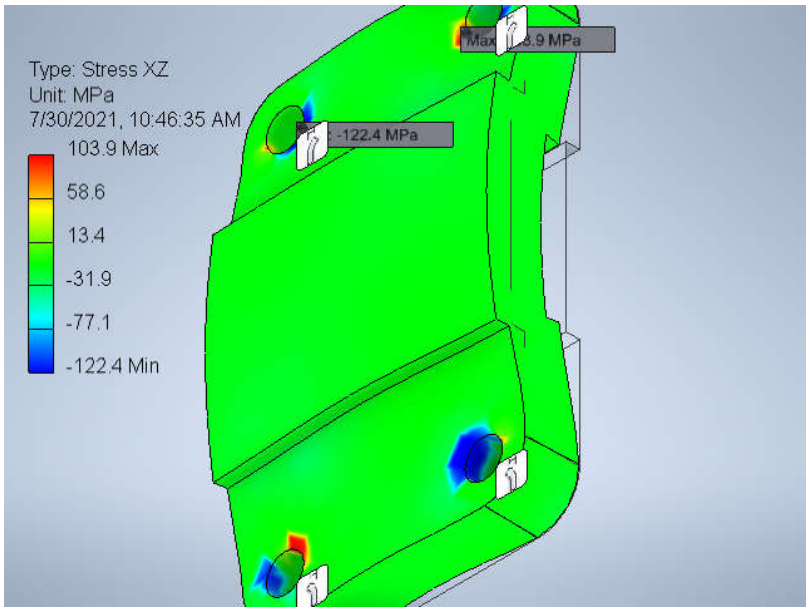
Stress XY


Type: Stress XY
Unit: MPa
7/30/2021, 10:46:33 AM
131.2 Max
78.6
26
-26.6
-79.2
-131.8 Min
Min: -131.8 MPa
Max: 131.2 MPa

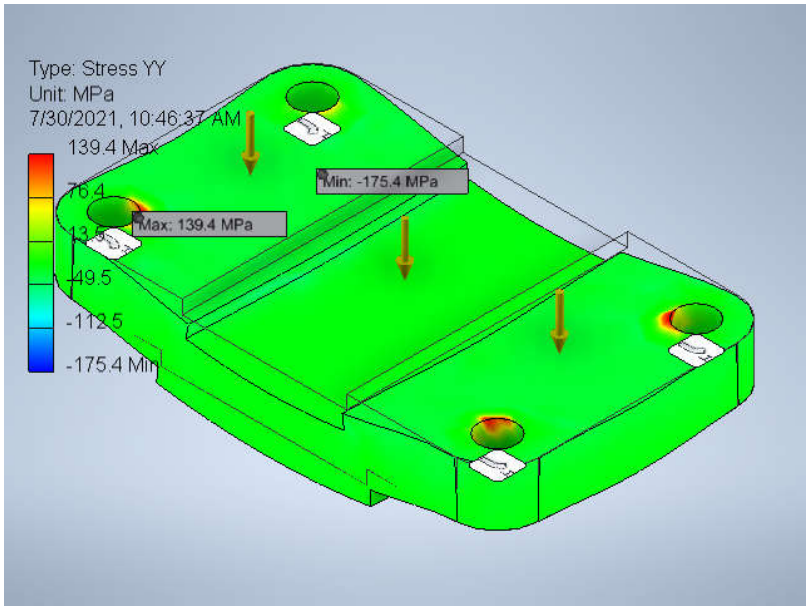

Type: Stress XY
Unit: MPa
7/30/2021, 10:46:33 AM
131.2 Max
78.6
26
-26.6
-79.2
-131.8 Min
131.2 MPa
Min: -131.8 MPa

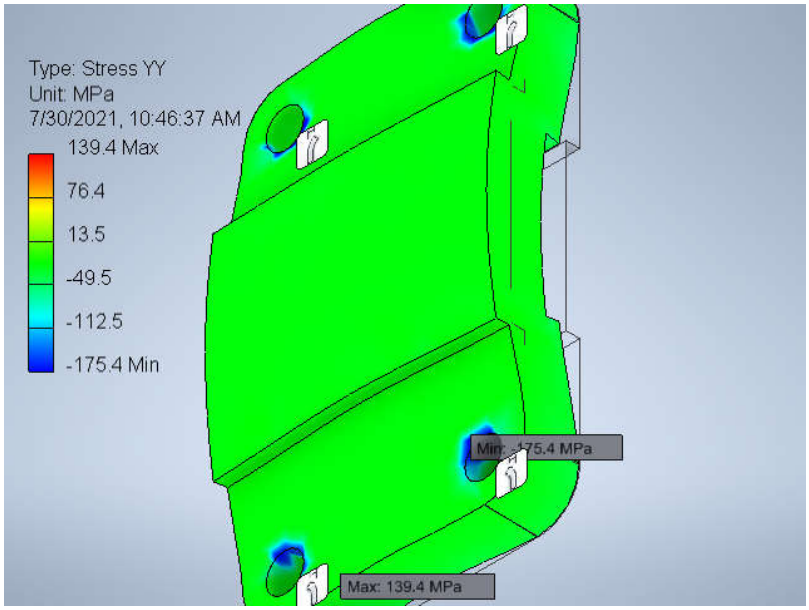
Stress XZ



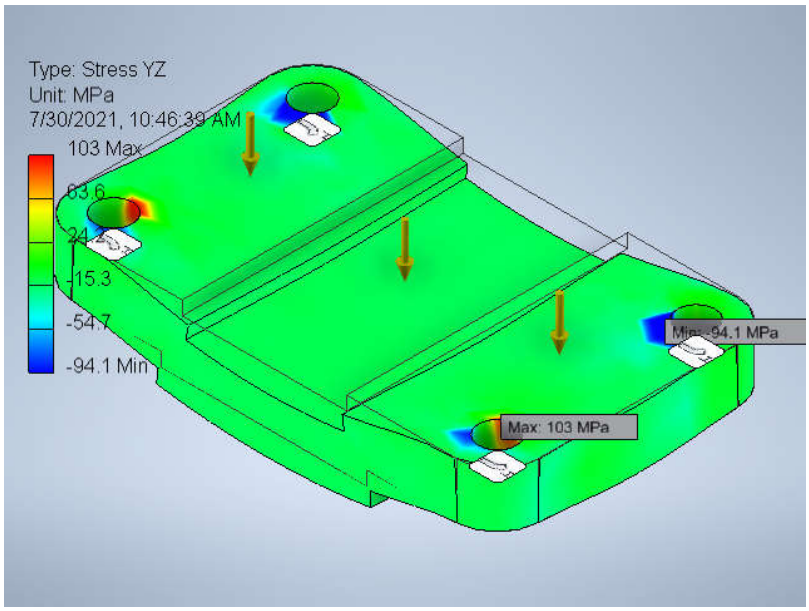


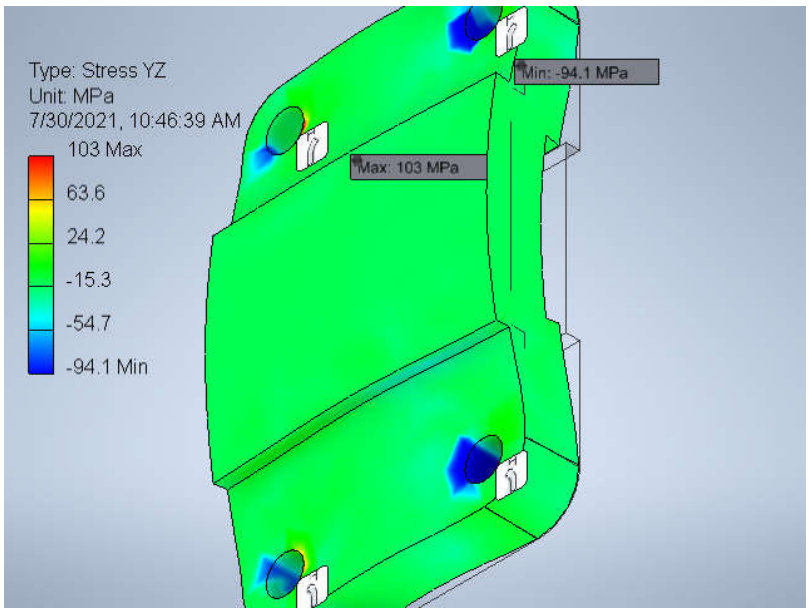
Stress YY



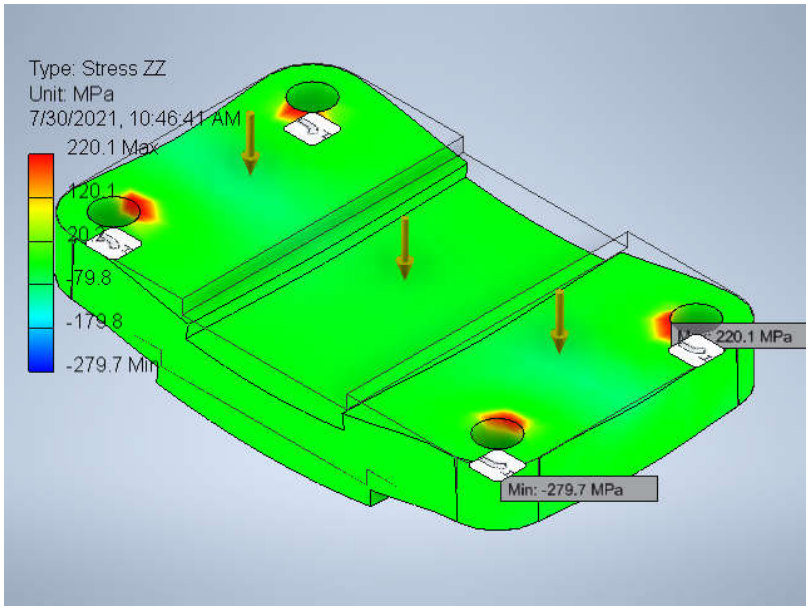

Type: Stress YY
Unit: MPa
7/30/2021, 10:46:37 AM
139.4 Max
76.4
13.5
-49.5
-112.5
-175.4 Min
Min: -175.4 MPa
Max: 139.4 MPa

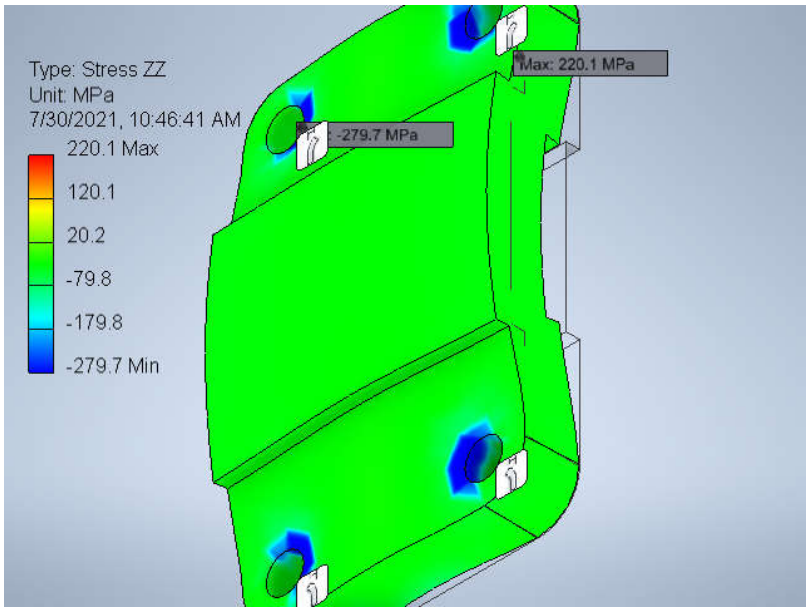
Stress YZ


Type: Stress YZ
Unit: MPa
7/30/2021, 10:46:39 AM
103 Max
63.6
24.2
-15.3
-54.7
-94.1 Min
Min: -94.1 MPa
Max: 103 MPa

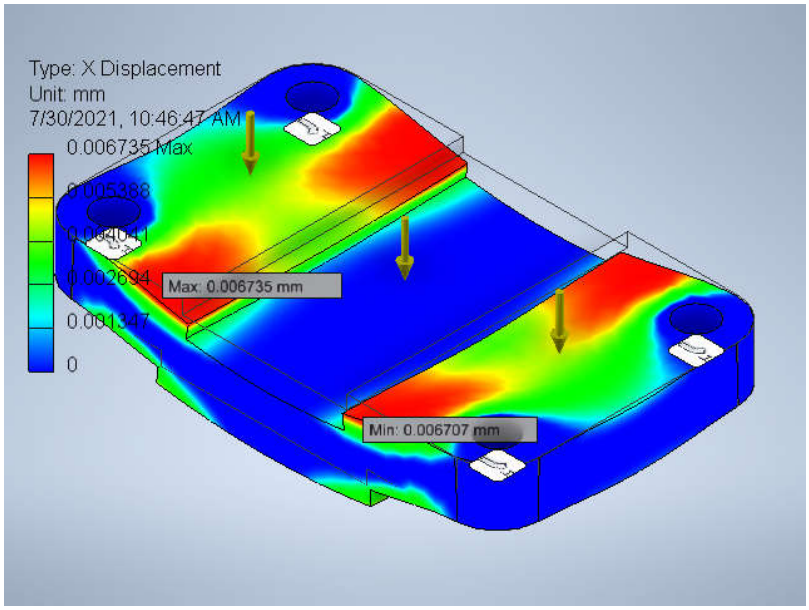

Type: Stress YZ
Unit: MPa
7/30/2021, 10:46:39 AM
103 Max
63.6
24.2
-15.3
-54.7
-94.1 Min
Min: -94.1 MPa
Max: 103 MPa

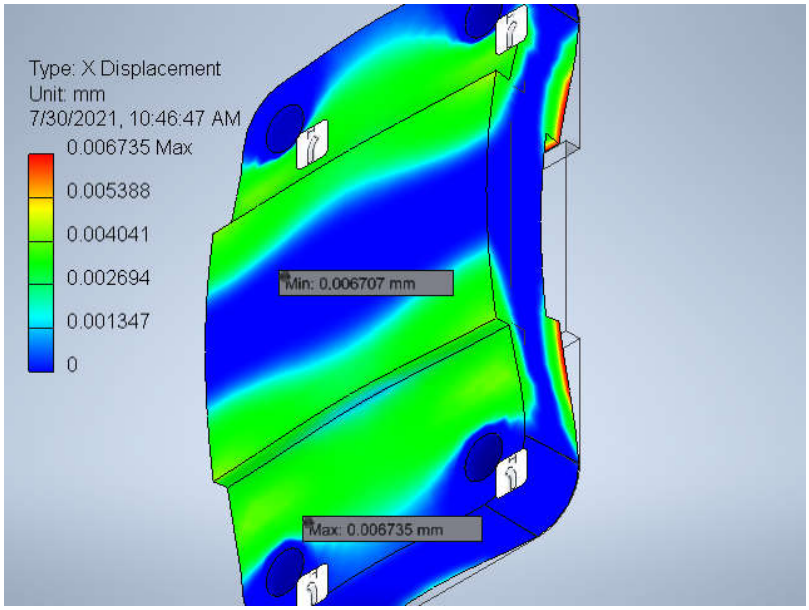
⊟ Stress ZZ



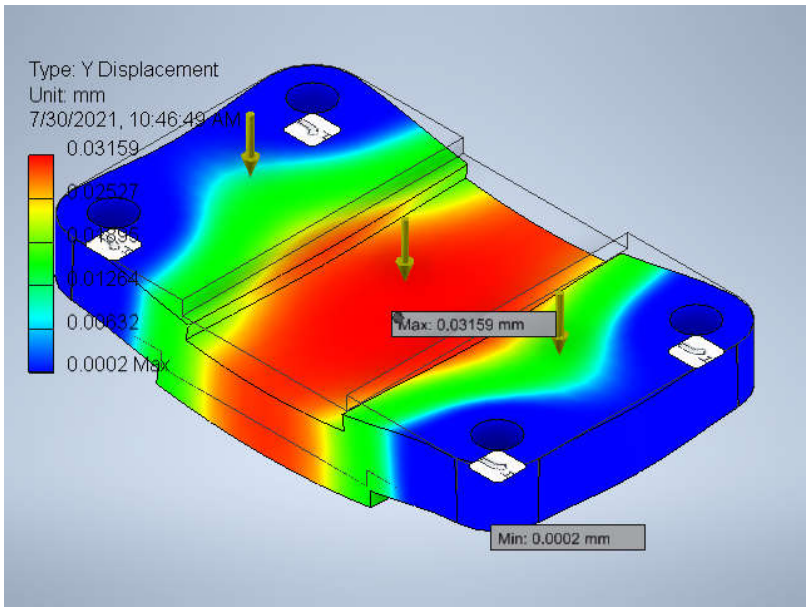


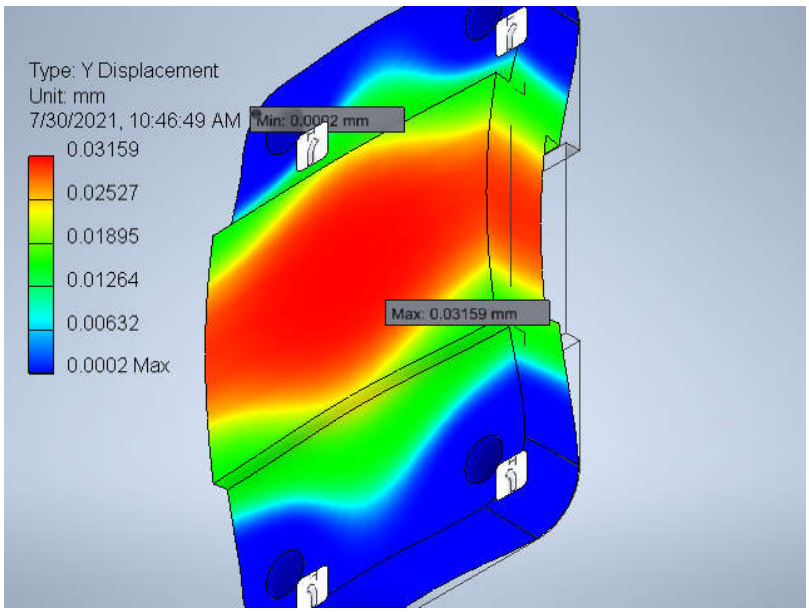
⊟ X Displacement



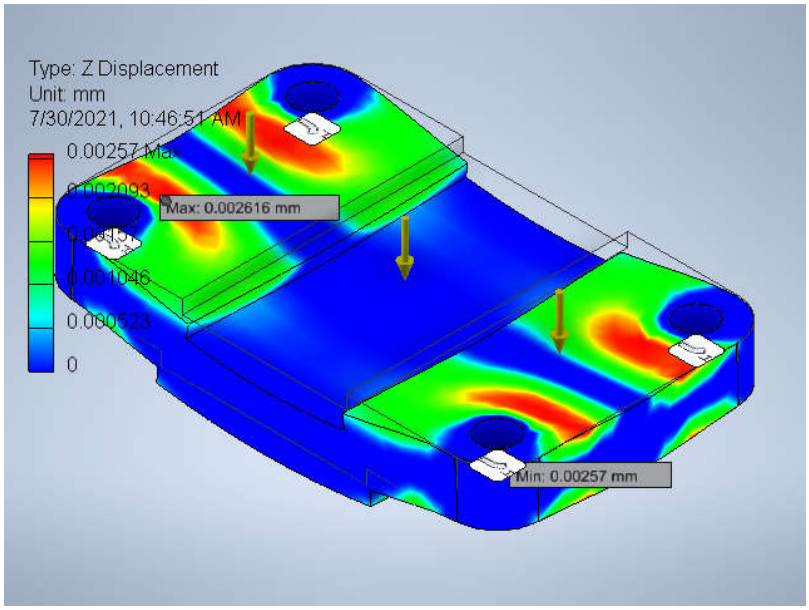


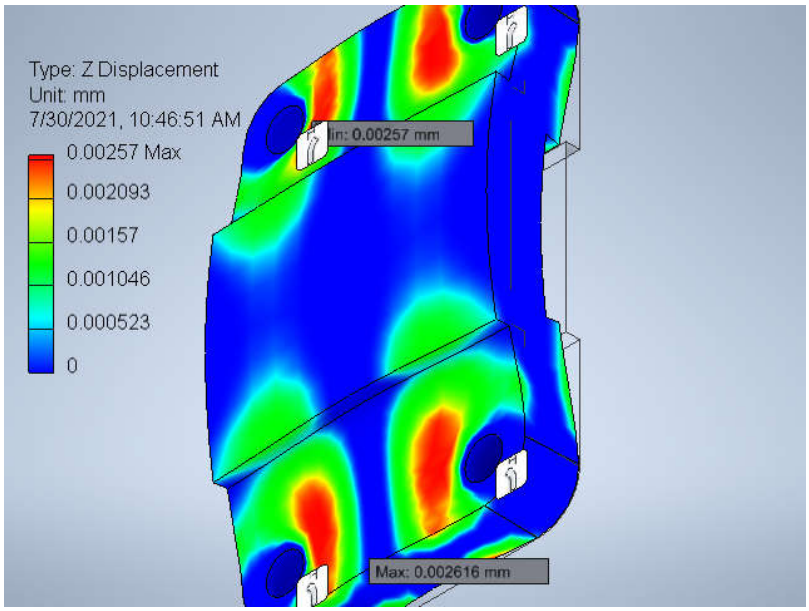
⊟ Y Displacement



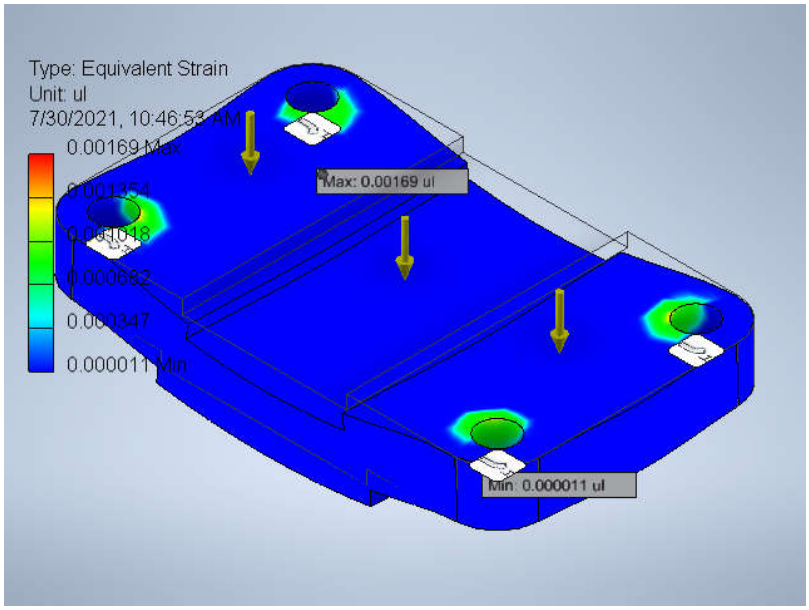


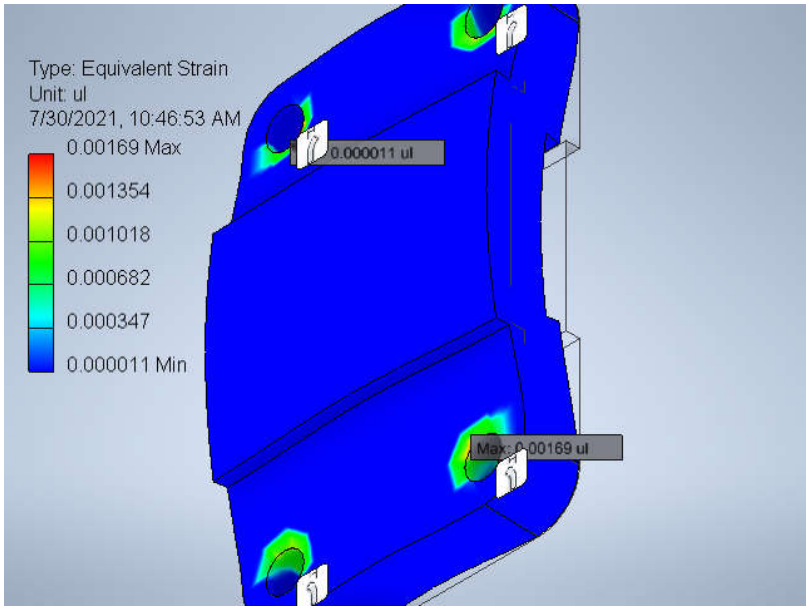
Z Displacement



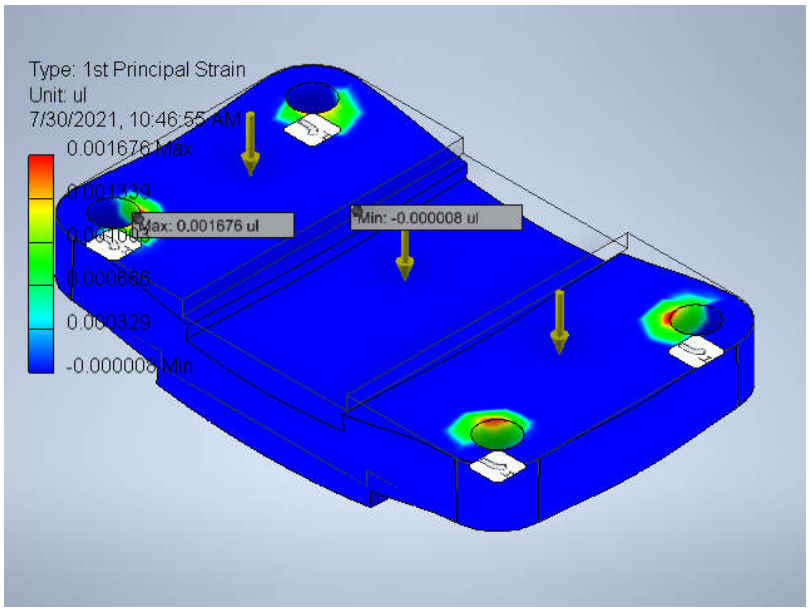


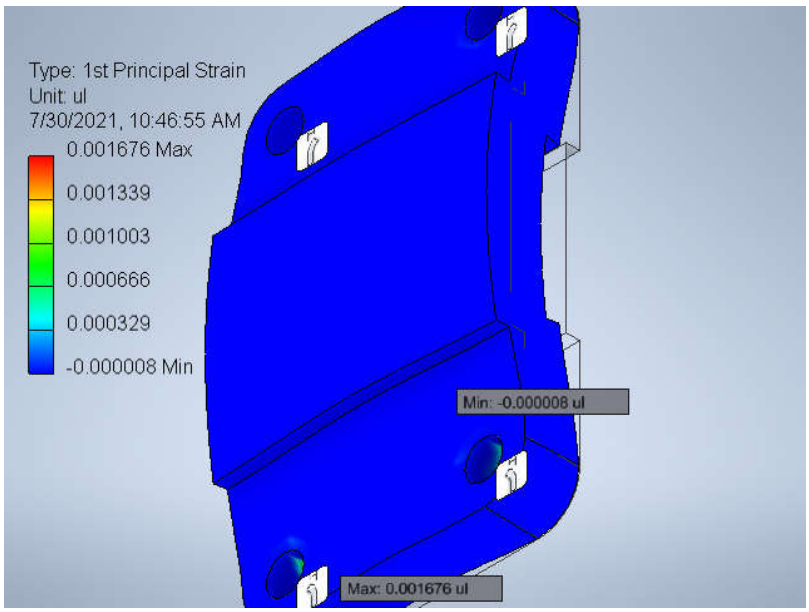
Equivalent Strain



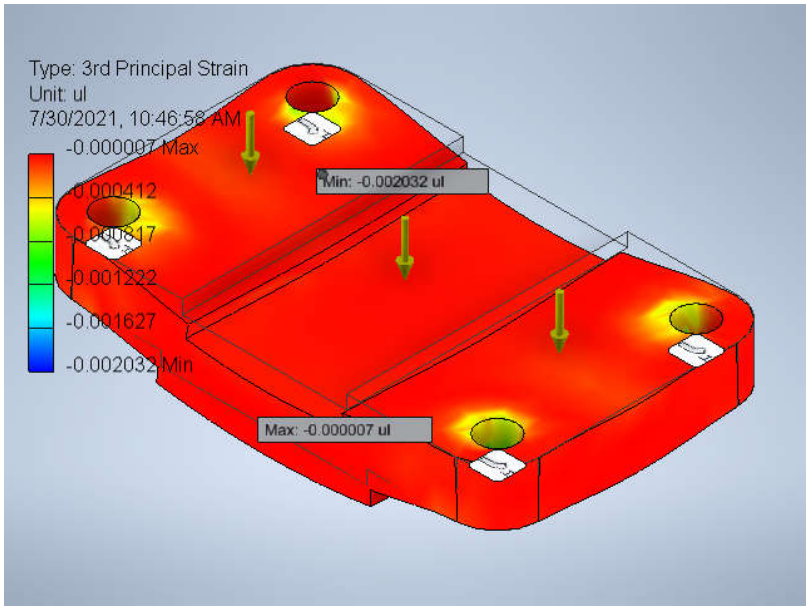


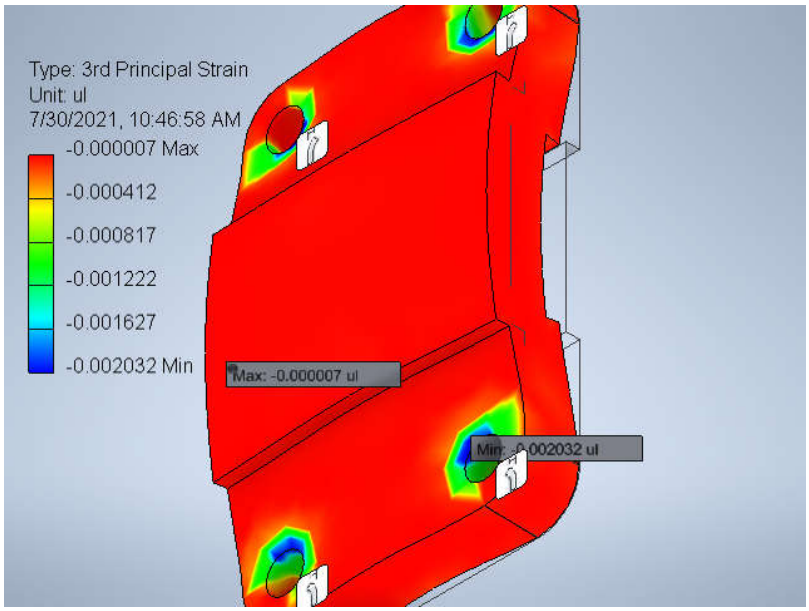
1st Principal Strain



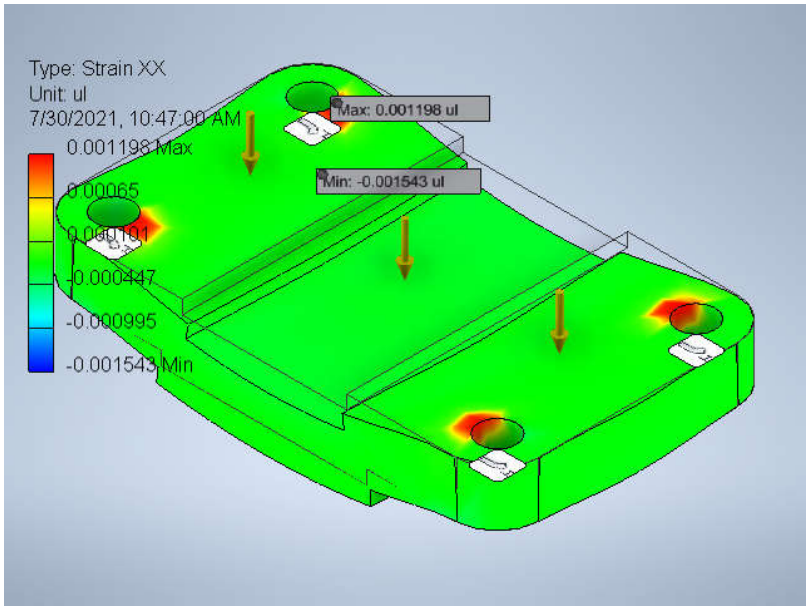


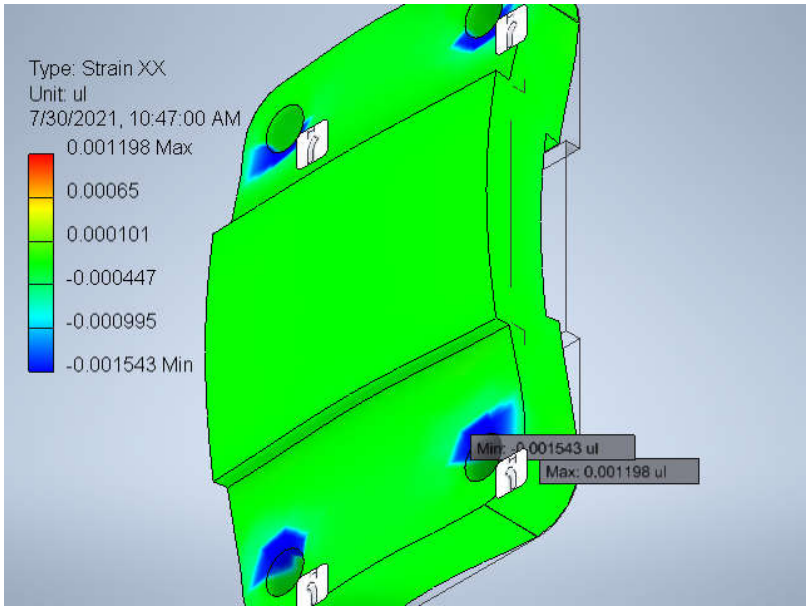
3rd Principal Strain



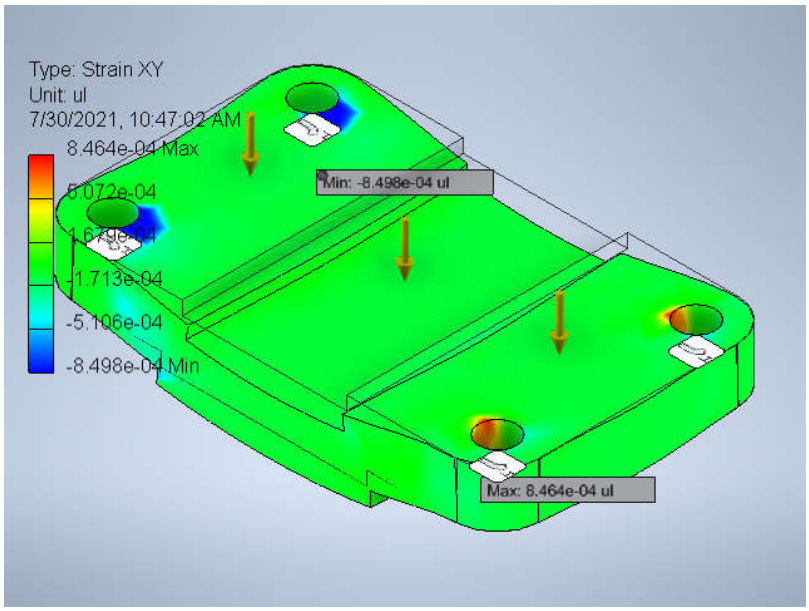


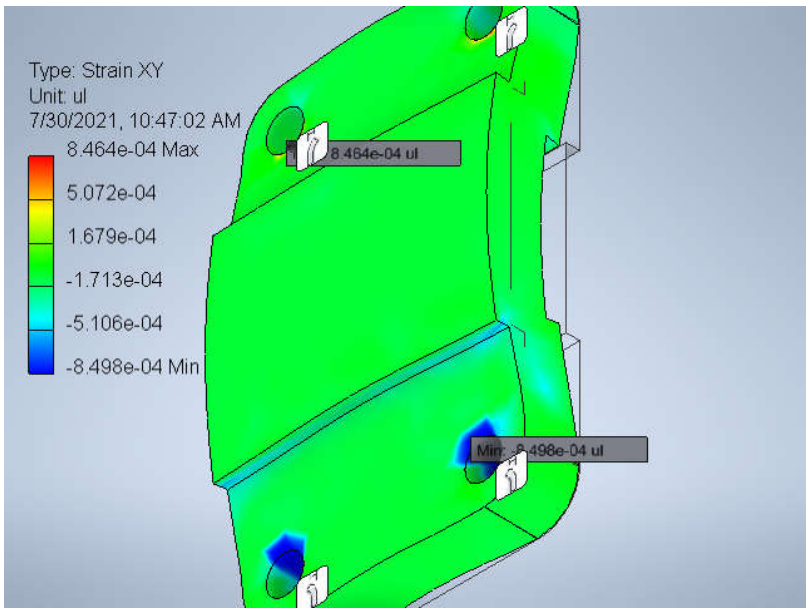
Strain XX




Type: Strain XX
Unit: ul
7/30/2021, 10:47:00 AM
0.001198 Max
0.00065
0.000101
-0.000447
-0.000995
-0.001543 Min
Min: -0.001543 ul
Max: 0.001198 ul

⊟ Strain XY


Type: Strain XY
Unit: ul
7/30/2021, 10:47:02 AM
8.464e-04 Max
5.072e-04
1.679e-04
-1.713e-04
-5.106e-04
-8.498e-04 Min
Min: -8.498e-04 ul
Max: 8.464e-04 ul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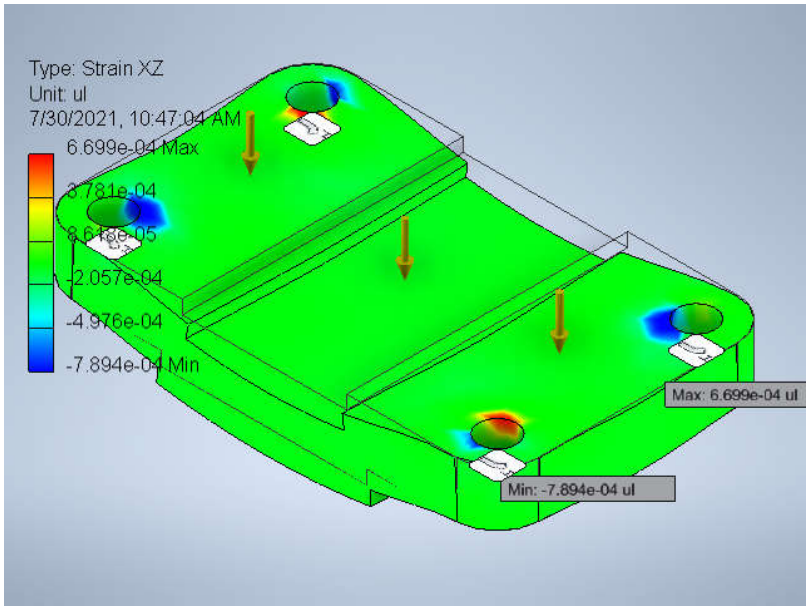
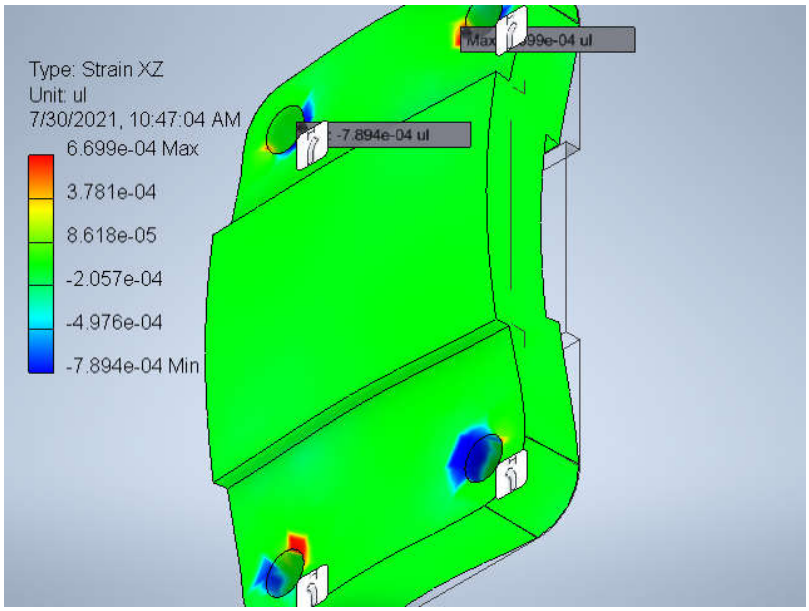
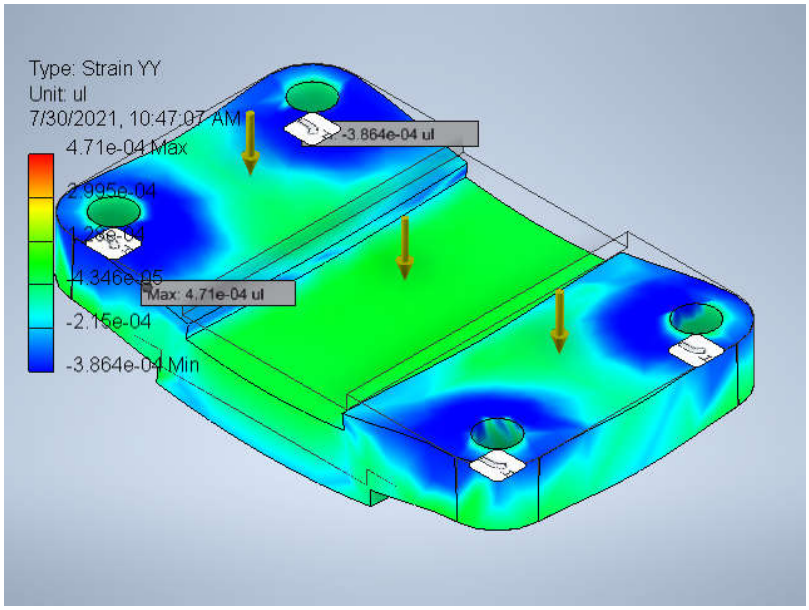
5.072e-04
1.679e-04
-1.713e-04
-5.106e-04
-8.498e-04 Min
8.464e-04 ul

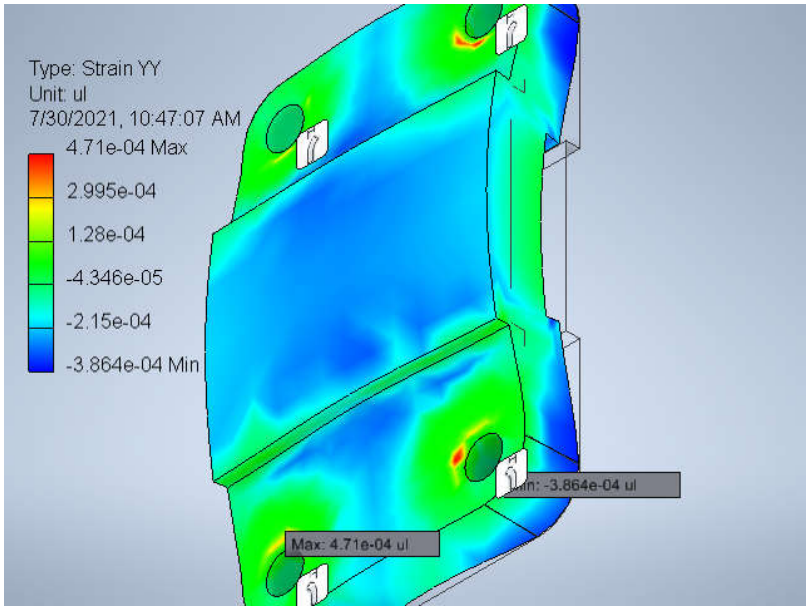
Strain XZ





Strain YY

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2.995e-04
1.28e-04
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-3.864e-04 Min
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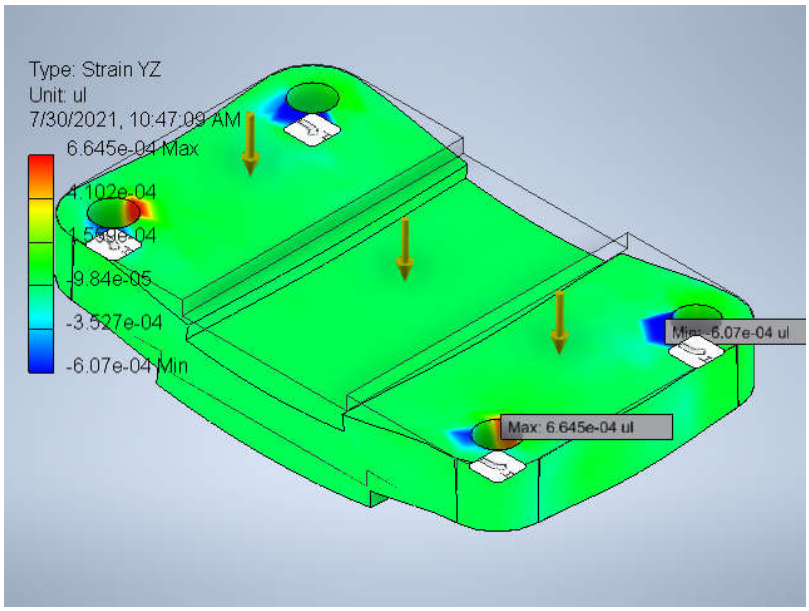
Max: 4.71e-04 ul

⊟ Strain YZ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7/30/2021, 10:47:09 AM
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4.102e-04
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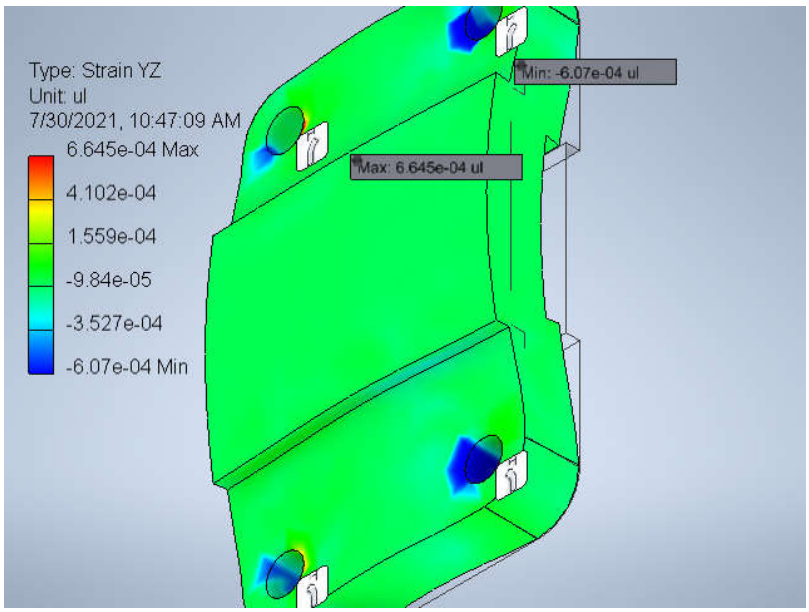
-6.07e-04 Min
Min: -6.07e-04 ul
Max: 6.645e-04 ul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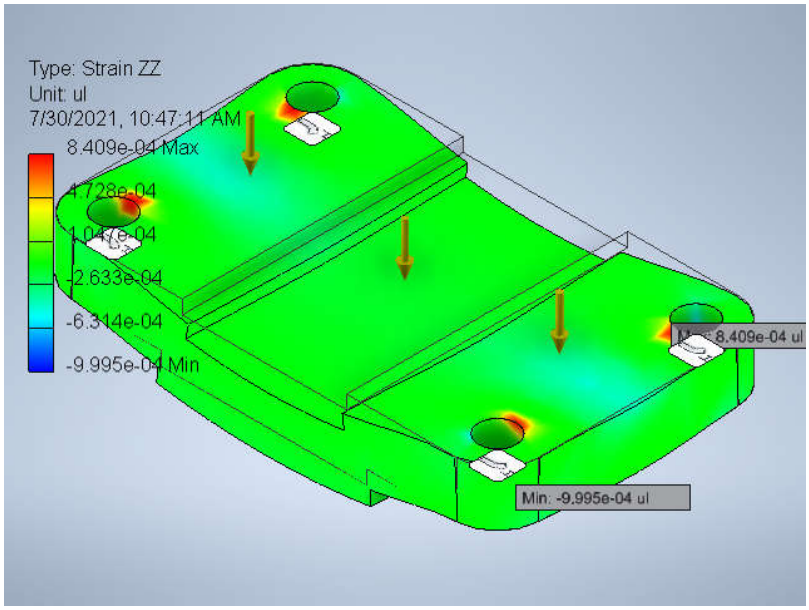
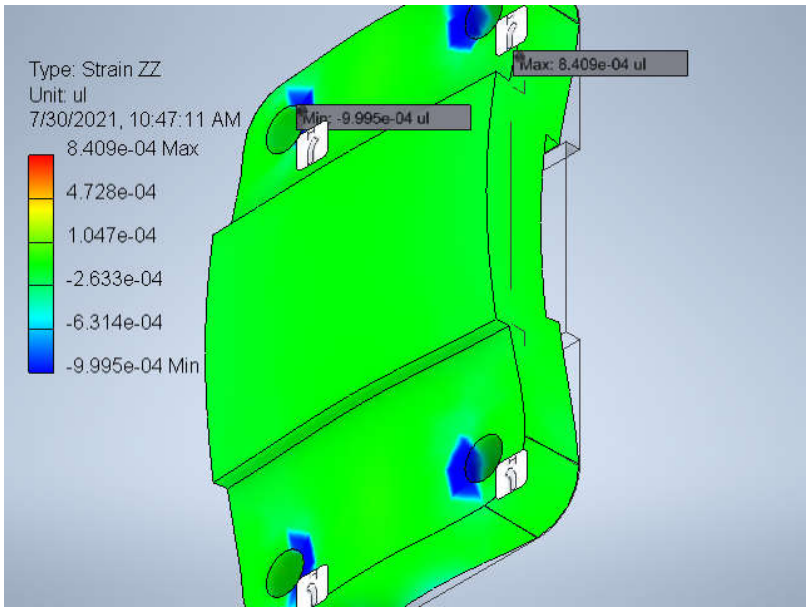
Strain ZZ





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