

Stress Analysis Report



| | |
|----------------------------|-----------------------------|
| Analyzed File: | PE-SANIFOS-280-TANK-V2.ipt |
| Autodesk Inventor Version: | 2012 (Build 160160000, 160) |
| Creation Date: | 24/08/2021, 11:23 AM |
| Simulation Author: | PE |
| Summary: | |

Project Info (iProperties)

Summary

| | |
|---------|-----------------------------------|
| Title | SANIFOS 280 |
| Subject | FEA TESTING TO AS/NZS 1546.1:2008 |
| Author | PE |
| Manager | Daryl Perusic |
| Company | Perusic Engineering |

Project

| | |
|--------------|------------------------|
| Part Number | PE-SANIFOS-280-TANK-V2 |
| Designer | PE |
| Cost | \$0.00 |
| Date Created | 24/07/2021 |

Status

| | |
|---------------|----------------|
| Design Status | WorkInProgress |
|---------------|----------------|

Custom

| | |
|----------------------|--|
| Translation Standard | STEP AP214IS |
| FileName | CUV2183526C.STEP |
| PreProcessor | SolidWorks 2018 |
| PostProcessor | Build: 160, Release: 2012 RTM - Date: Tue 03/01/2011 |
| Sent Units | millimeter |
| Uncertainty | 0.00 |

Physical

| | |
|-------------------|--|
| Material | LLDPE Linear Low Density Polyethylene |
| Density | 0.936 g/cm ³ |
| Mass | 6.69195 kg |
| Area | 2844900 mm ² |
| Volume | 7149520 mm ³ |
| Center of Gravity | x=187.712 mm y=7.80388 mm z=525.708 mm |

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

Simulation: LATERAL LOADS AS/NZS 1546.1:2008 APPENDIX H

General objective and settings:

| | |
|---------------------------------------|----------------------|
| Design Objective | Single Point |
| Simulation Type | Static Analysis |
| Last Modification Date | 24/08/2021, 11:09 AM |
| Detect and Eliminate Rigid Body Modes | No |

Advanced settings:

| | |
|--|--------|
| Avg. Element Size (fraction of model diameter) | 0.2 |
| 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)**

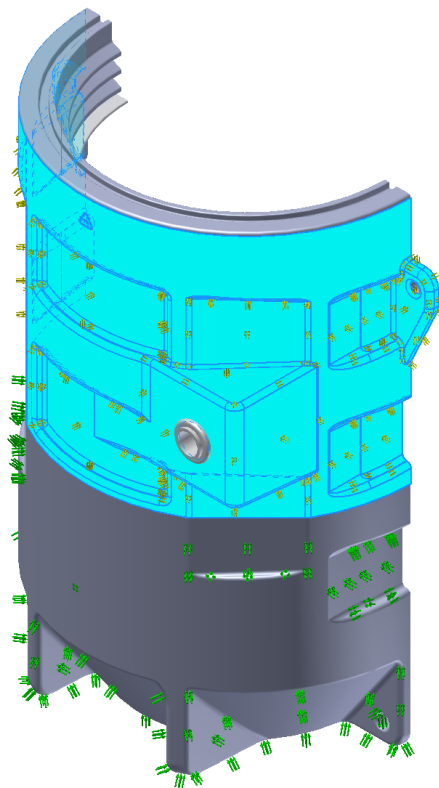
| | | |
|----------------|---------------------------------------|-------------------------|
| Name | LLDPE Linear Low Density Polyethylene | |
| General | Mass Density | 0.936 g/cm ³ |
| | Yield Strength | 20 MPa |
| | Ultimate Tensile Strength | 32 MPa |
| Stress | Young's Modulus | 0.2 GPa |
| | Poisson's Ratio | 0.41 ul |
| | Shear Modulus | 0.070922 GPa |
| Stress Thermal | Expansion Coefficient | 0.00018 ul/c |
| | Thermal Conductivity | 0.225 W/(m K) |
| | Specific Heat | 3182 J/(kg c) |
| Part Name(s) | PE-SANIFOS-280-TANK-V2.ipt | |

☐ **Operating conditions**

☐ **Pressure: 0.5m 5.5kPa**

| | |
|-----------|-----------|
| Load Type | Pressure |
| Magnitude | 0.798 psi |

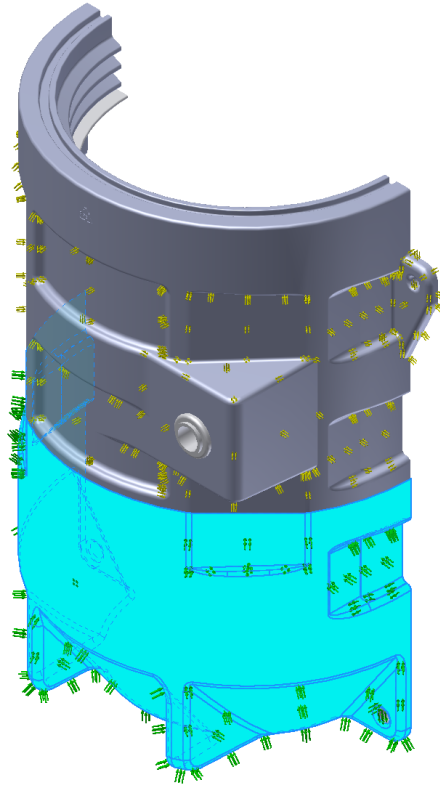
☐ **Selected Face(s)**



☐ **Pressure: 1.0m 11.0 kPa**

| | |
|-----------|-----------|
| Load Type | Pressure |
| Magnitude | 0.011 MPa |

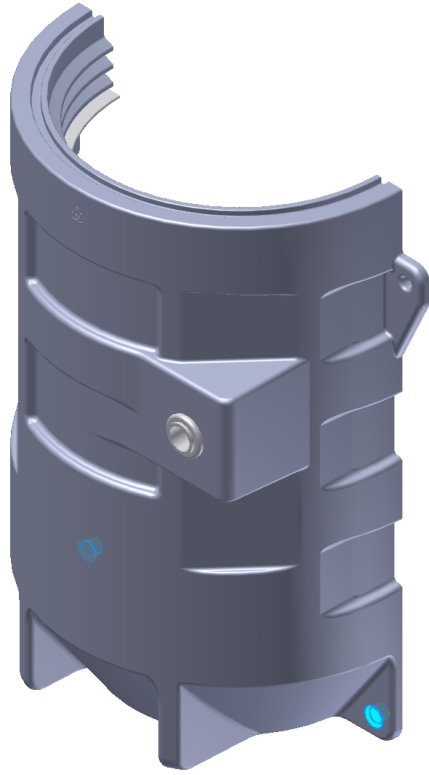
☐ **Selected Face(s)**



☐ **Fixed Constraint: PINS**

Constraint Type Fixed Constraint

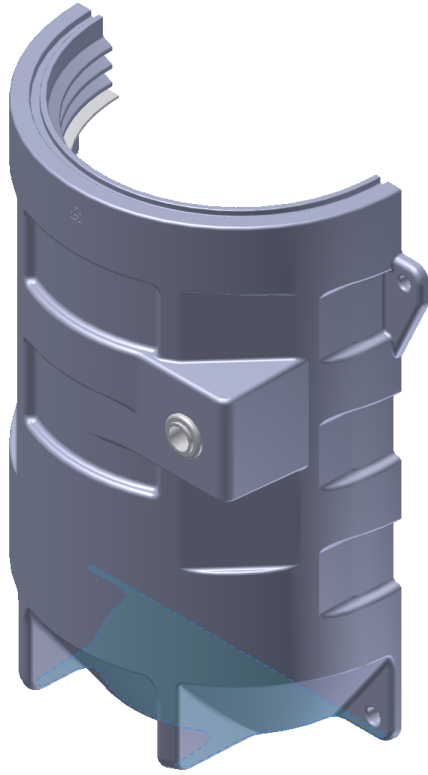
☐ **Selected Face(s)**



Frictionless Constraint: BASE

Constraint Type Frictionless Constraint

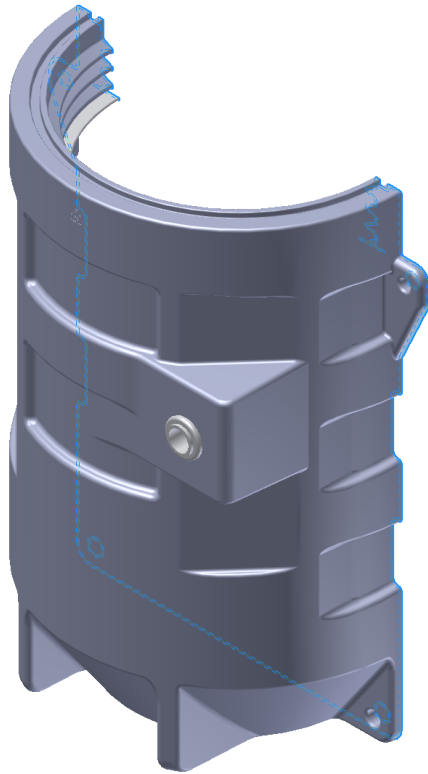
Selected Face(s)



Frictionless Constraint: HALF

Constraint Type Frictionless 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: PINS | 546.053 N | 39.54 N | 12.9251 N m | -12.3959 N m |
| | | 0 N | | 3.66039 N m |
| | | -544.62 N | | 0 N m |
| Frictionless Constraint: BASE | 456.554 N | 66.6652 N | 139.582 N m | 12.657 N m |
| | | 0 N | | 139.006 N m |
| | | -451.66 N | | -0.578706 N m |
| Frictionless Constraint: HALF | 4924.59 N | 4924.58 N | 303.846 N m | 0 N m |
| | | 0 N | | -303.787 N m |
| | | -5.14395 N | | 5.96847 N m |

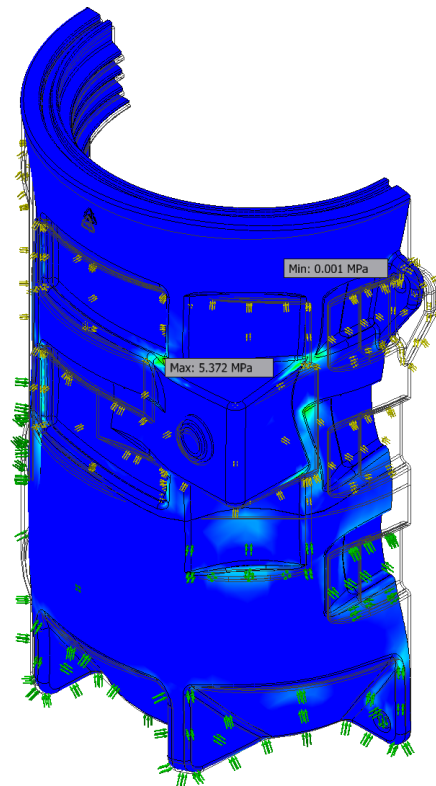
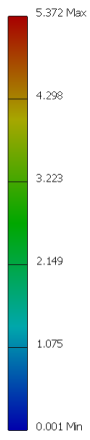
Result Summary

| Name | Minimum | Maximum |
|-------------------|-------------------------|--------------|
| Volume | 7146340 mm ³ | |
| Mass | 6.68897 kg | |
| Von Mises Stress | 0.000502801 MPa | 5.3718 MPa |
| Displacement | 0 mm | 9.92027 mm |
| Safety Factor | 3.72315 ul | 15 ul |
| Equivalent Strain | 0.00000239787 ul | 0.0256072 ul |

Figures

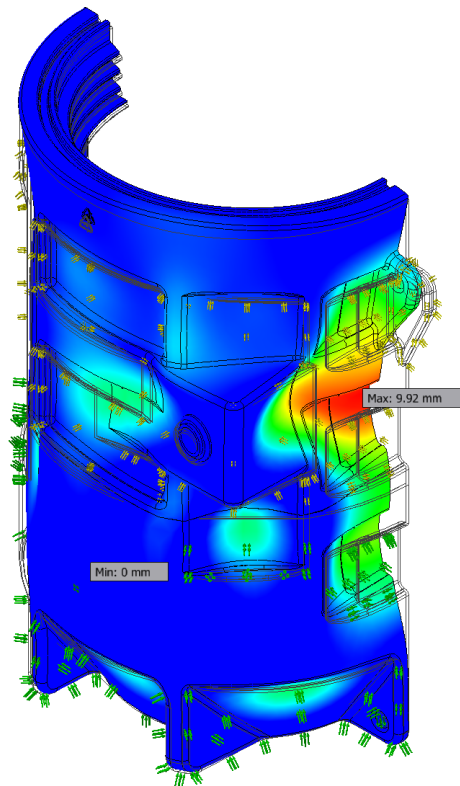
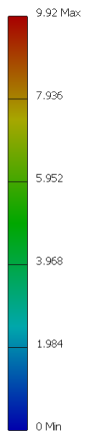
Von Mises Stress

Type: Von Mises Stress
Unit: MPa
24/08/2021, 11:23:45 AM



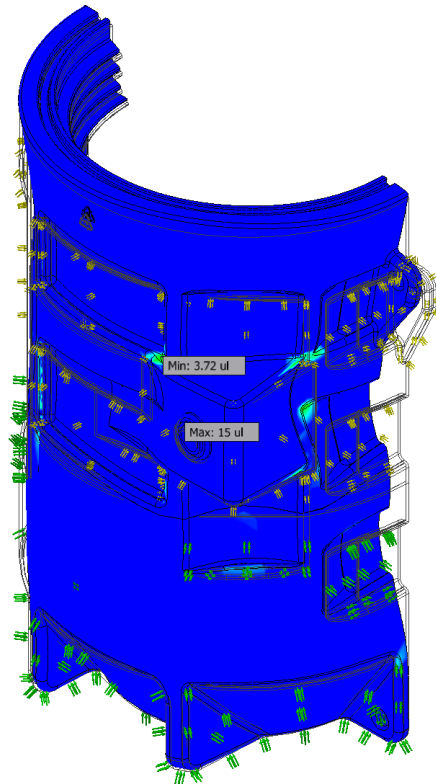
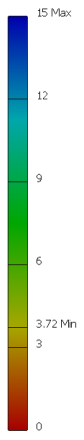
Displacement

Type: Displacement
Unit: mm
24/08/2021, 11:24:17 AM



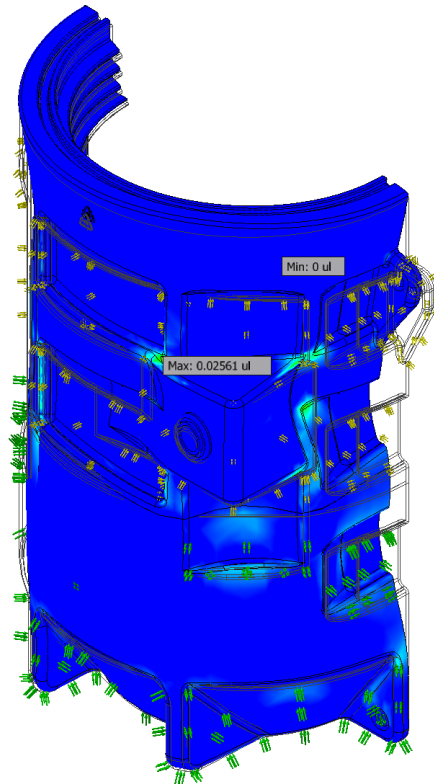
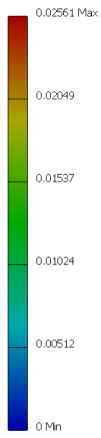
Safety Factor

Type: Safety Factor
Unit: ul
24/08/2021, 11:24:01 AM



Equivalent Strain

Type: Equivalent Strain
 Unit: ul
 24/08/2021, 11:24:34 AM



Simulation: HYDROSTATIC UPLIFT LOADS AS/NZS:1546.1:2008

General objective and settings:

| | |
|---------------------------------------|----------------------|
| Design Objective | Single Point |
| Simulation Type | Static Analysis |
| Last Modification Date | 24/08/2021, 11:05 AM |
| Detect and Eliminate Rigid Body Modes | No |

Advanced settings:

| | |
|--|--------|
| Avg. Element Size (fraction of model diameter) | 0.2 |
| Min. Element Size (fraction of avg. size) | 0.1 |
| Grading Factor | 1.5 |
| Max. Turn Angle | 60 deg |
| Create Curved Mesh Elements | Yes |

Material(s)

| | | |
|----------------|---------------------------------------|-------------------------|
| Name | LLDPE Linear Low Density Polyethylene | |
| General | Mass Density | 0.936 g/cm ³ |
| | Yield Strength | 20 MPa |
| | Ultimate Tensile Strength | 32 MPa |
| Stress | Young's Modulus | 0.2 GPa |
| | Poisson's Ratio | 0.41 ul |
| | Shear Modulus | 0.070922 GPa |
| Stress Thermal | Expansion Coefficient | 0.00018 ul/c |
| | Thermal Conductivity | 0.225 W/(m K) |
| | Specific Heat | 3182 J/(kg c) |
| Part Name(s) | PE-SANIFOS-280-TANK-V2.ipt | |

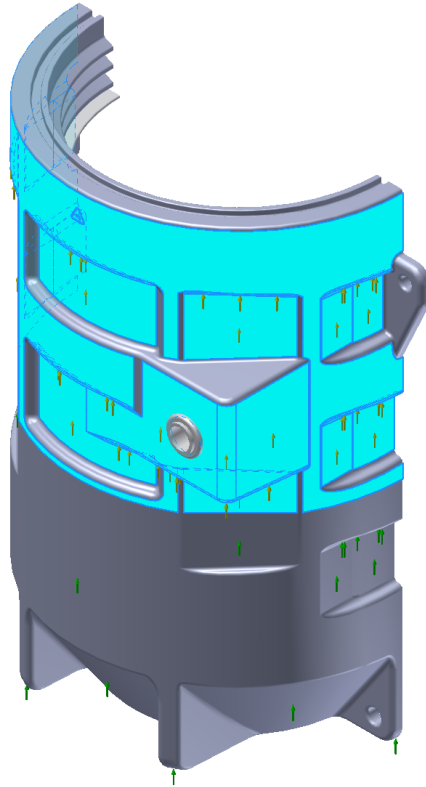
Operating conditions

Force: 0.5m 4.905 kPa

| | |
|-----------|-----------|
| Load Type | Force |
| Magnitude | 809.325 N |
| Vector X | 0.000 N |
| Vector Y | 0.000 N |

Vector Z | 809.325 N

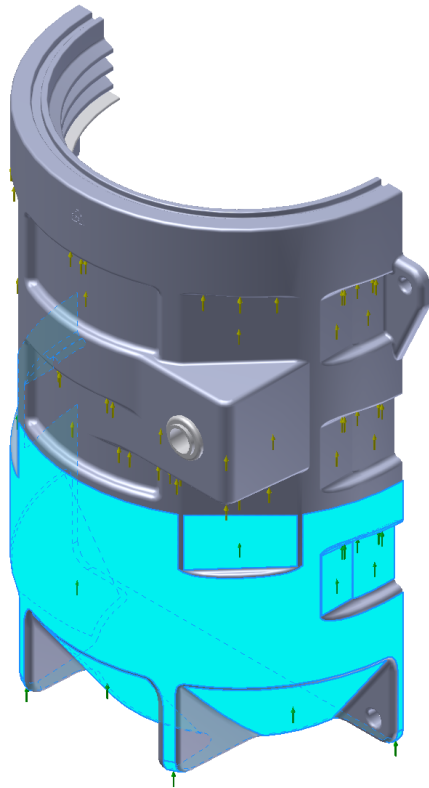
Selected Face(s)



Force: 1.0m 9.81 kPa

| | |
|-----------|------------|
| Load Type | Force |
| Magnitude | 1618.650 N |
| Vector X | 0.000 N |
| Vector Y | 0.000 N |
| Vector Z | 1618.650 N |

Selected Face(s)



Fixed Constraint: PINS

Constraint Type Fixed Constraint

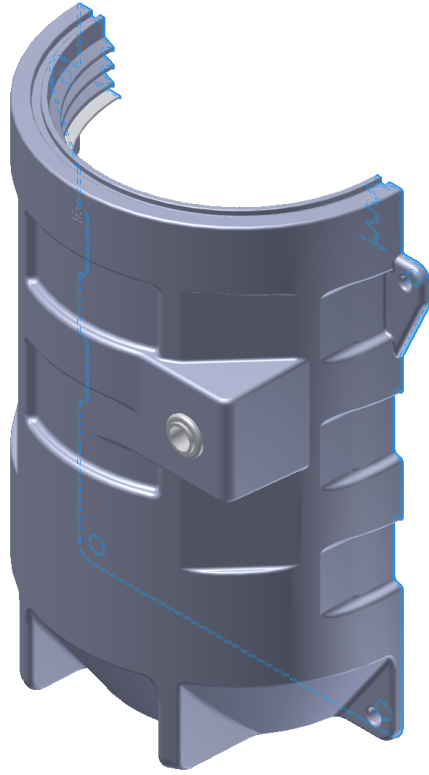
Selected Face(s)



☐ **Frictionless Constraint: HALF**

Constraint Type Frictionless Constraint

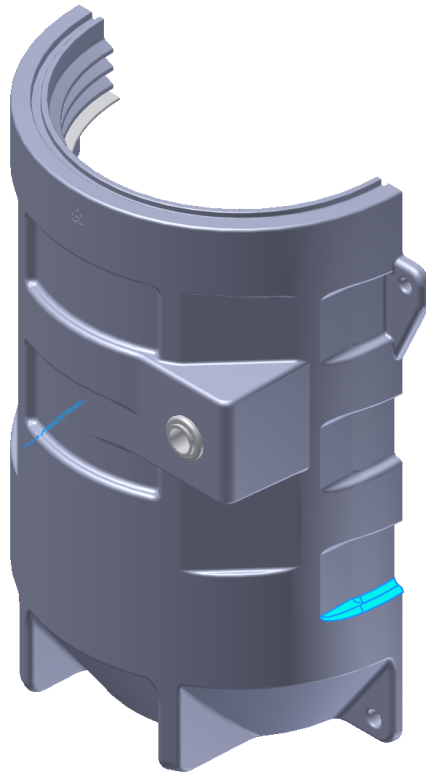
☐ **Selected Face(s)**



Frictionless Constraint: CONCRETE

Constraint Type Frictionless 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: PINS | 509.699 N | -49.2875 N | 2.41726 N m | 0.924365 N m |
| | | 25.7072 N | | 1.96435 N m |
| | | -506.659 N | | 1.06302 N m |
| Frictionless Constraint: HALF | 443.451 N | -443.427 N | 340.595 N m | -1.00775 N m |
| | | -4.61524 N | | 340.274 N m |
| | | 0 N | | 14.7411 N m |
| Frictionless Constraint: CONCRETE | 1983.57 N | 493.117 N | 86.6071 N m | -30.441 N m |
| | | -20.3541 N | | 79.6571 N m |
| | | -1921.19 N | | -15.1289 N m |

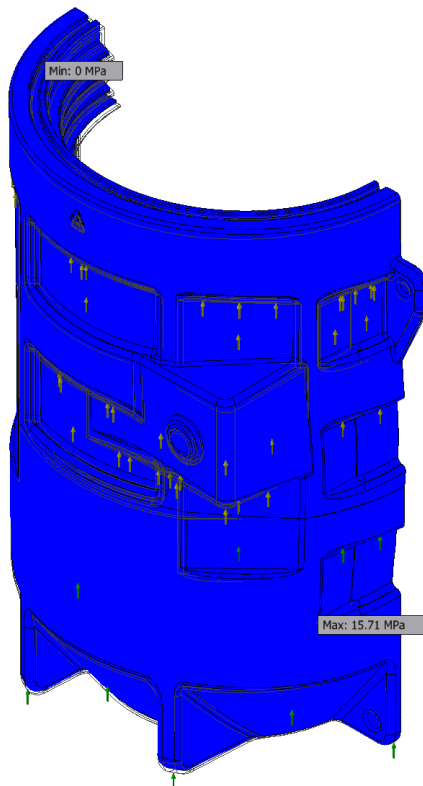
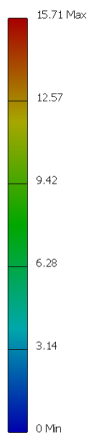
Result Summary

| Name | Minimum | Maximum |
|-------------------|-------------------------|--------------|
| Volume | 7146340 mm ³ | |
| Mass | 6.68897 kg | |
| Von Mises Stress | 0.00248222 MPa | 15.7067 MPa |
| Displacement | 0 mm | 34.627 mm |
| Safety Factor | 1.27335 ul | 15 ul |
| Equivalent Strain | 0.0000123844 ul | 0.0774445 ul |

Figures

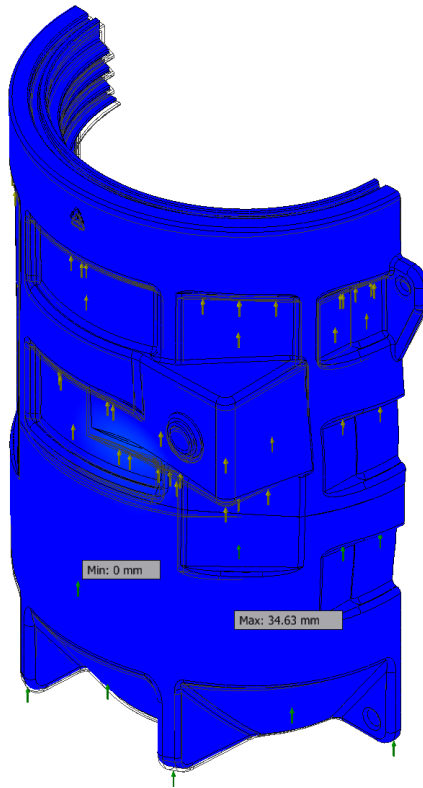
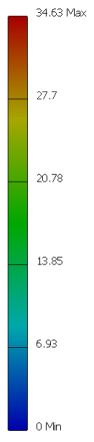
Von Mises Stress

Type: Von Mises Stress
Unit: MPa
24/08/2021, 11:25:05 AM



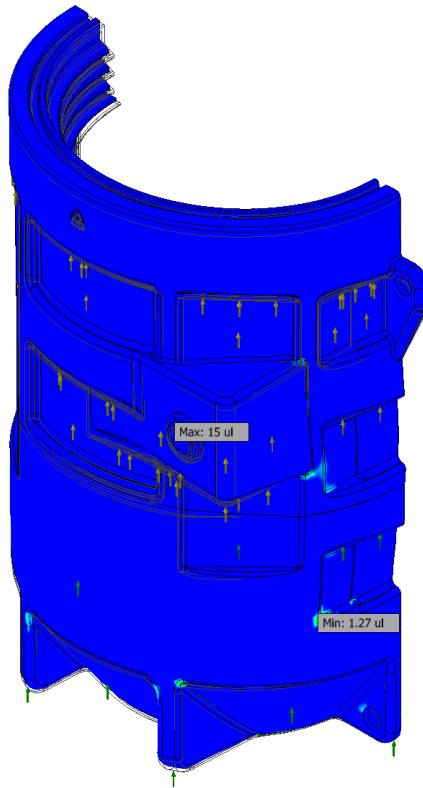
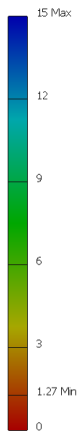
Displacement

Type: Displacement
Unit: mm
24/08/2021, 11:25:29 AM



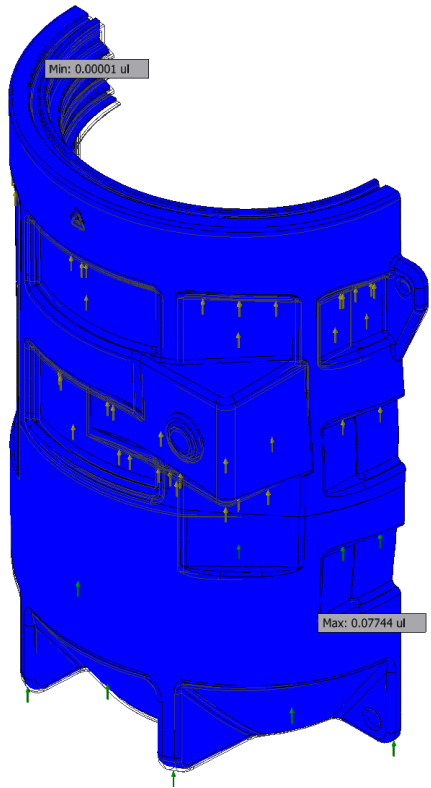
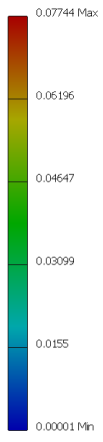
Safety Factor

Type: Safety Factor
Unit: ul
24/08/2021, 11:25:17 AM



Equivalent Strain

Type: Equivalent Strain
Unit: ul
24/08/2021, 11:25:40 AM



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