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|  | |  | | --- | | **Simulation of panel\_assembly\_test4.5**  **Date: Sunday, April 18, 2021 Designer: Solidworks**  **Study name: Static 1**  **Analysis type: Static** | | Table of Contents  [Description 1](#_Toc69599187)  [Assumptions 2](#_Toc69599188)  [Model Information 2](#_Toc69599189)  [Study Properties 3](#_Toc69599190)  [Units 4](#_Toc69599191)  [Material Properties 5](#_Toc69599192)  [Loads and Fixtures 6](#_Toc69599193)  [Connector Definitions 7](#_Toc69599194)  [Contact Information 8](#_Toc69599195)  [Mesh information 9](#_Toc69599196)  [Sensor Details 10](#_Toc69599197)  [Resultant Forces 11](#_Toc69599198)  [Beams 11](#_Toc69599199)  [Study Results 12](#_Toc69599200)  [Conclusion 14](#_Toc69599201) | |
| Description No Data |

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| Assumptions |

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| Model Information  |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  | | --- | |  |   ****Model name:** panel\_assembly\_test4.5**  ****Current Configuration:** Default** | | | | | ****Solid Bodies**** | | | | | ****Document Name and Reference**** | ****Treated As**** | ****Volumetric Properties**** | ****Document Path/Date Modified**** | | **Boss-Extrude1** | **Solid Body** | ****Mass:0.0087723 kg****  ****Volume:3.249e-06 m^3****  ****Density:2,700 kg/m^3****  ****Weight:0.0859685 N**** | ****C:\Users\luisa\Documents\GrabCAD\Lunar Dust Challenge\Current\Mechanical\v3\_tiz\FEA\4.5 INCHES\4.5adhesive\_test.SLDPRT****  **Apr 18 00:06:39 2021** | | **Split Line1** | **Solid Body** | ****Mass:0.137333 kg****  ****Volume:5.44971e-05 m^3****  ****Density:2,520 kg/m^3****  ****Weight:1.34586 N**** | ****C:\Users\luisa\Documents\GrabCAD\Lunar Dust Challenge\Current\Mechanical\v3\_tiz\FEA\4.5 INCHES\4.5bplate\_test.SLDPRT****  **Apr 18 00:11:48 2021** | | **Fillet2** | **Solid Body** | ****Mass:0.0136297 kg****  ****Volume:9.59839e-06 m^3****  ****Density:1,420 kg/m^3****  ****Weight:0.133571 N**** | ****C:\Users\luisa\Documents\GrabCAD\Lunar Dust Challenge\Current\Mechanical\v3\_tiz\FEA\4.5 INCHES\4.5pcb\_mockup\_test.SLDPRT****  **Apr 18 00:06:40 2021** | | **Split Line1** | **Solid Body** | ****Mass:0.0269796 kg****  ****Volume:1.2996e-05 m^3****  ****Density:2,075.99 kg/m^3****  ****Weight:0.2644 N**** | ****C:\Users\luisa\Documents\GrabCAD\Lunar Dust Challenge\Current\Mechanical\v3\_tiz\FEA\4.5 INCHES\4.5tplate\_test.SLDPRT****  **Apr 18 00:13:08 2021** | |

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| Study Properties  |  |  | | --- | --- | | Study name | Static 1 | | 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 | FFEPlus | | 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\luisa\Documents\GrabCAD\Lunar Dust Challenge\Current\Mechanical\v3\_tiz\FEA) | |

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| Units  |  |  | | --- | --- | | Unit system: | SI (MKS) | | Length/Displacement | mm | | Temperature | Kelvin | | Angular velocity | Rad/sec | | Pressure/Stress | N/m^2 | |

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| Material Properties  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | ****Model Reference**** | ****Properties**** | ****Components**** | | | | | |  | |  |  | | --- | --- | | ****Name:**** | **STYCAST 2850FT/Catalyst 23LV** | | ****Model type:**** | **Linear Elastic Isotropic** | | ****Default failure criterion:**** | **Mohr-Coulomb Stress** | | ****Tensile strength:**** | **1.0549e+08 N/m^2** | | ****Compressive strength:**** | **1.19969e+08 N/m^2** | | ****Elastic modulus:**** | **9e+10 N/m^2** | | ****Poisson's ratio:**** | **0.3** | | ****Mass density:**** | **2,700 kg/m^3** | | **SolidBody 1(Boss-Extrude1)(4.5adhesive\_test-1)** | | | | | | **Curve Data:N/A** | | | | | | | |  | |  |  | | --- | --- | | ****Name:**** | **Macor (1)** | | ****Model type:**** | **Linear Elastic Isotropic** | | ****Default failure criterion:**** | **Unknown** | | ****Yield strength:**** | **3.29e+07 N/m^2** | | ****Tensile strength:**** | **9.4e+07 N/m^2** | | ****Compressive strength:**** | **3.45e+08 N/m^2** | | ****Elastic modulus:**** | **6.69e+10 N/m^2** | | ****Poisson's ratio:**** | **0.29** | | ****Mass density:**** | **2,520 kg/m^3** | | ****Shear modulus:**** | **2.55e+10 N/m^2** | | ****Thermal expansion coefficient:**** | **8e-06 /Kelvin** | | **SolidBody 1(Split Line1)(4.5bplate\_test-1)** | | | | | | **Curve Data:N/A** | | | | | | | |  | |  |  | | --- | --- | | ****Name:**** | **Kapton** | | ****Model type:**** | **Linear Elastic Isotropic** | | ****Default failure criterion:**** | **Mohr-Coulomb Stress** | | ****Yield strength:**** | **6.9e+07 N/m^2** | | ****Tensile strength:**** | **2.31e+08 N/m^2** | | ****Compressive strength:**** | **2.31e+08 N/m^2** | | ****Elastic modulus:**** | **2.76e+09 N/m^2** | | ****Poisson's ratio:**** | **0.34** | | ****Mass density:**** | **1,420 kg/m^3** | | ****Thermal expansion coefficient:**** | **20 /Kelvin** | | **SolidBody 1(Fillet2)(4.5pcb\_mockup\_test-1)** | | | | | | **Curve Data:N/A** | | | | | | | |  | |  |  | | --- | --- | | ****Name:**** | **99.5% Aluminum Oxide** | | ****Model type:**** | **Linear Elastic Isotropic** | | ****Default failure criterion:**** | **Mohr-Coulomb Stress** | | ****Yield strength:**** | **2.17185e+07 N/m^2** | | ****Tensile strength:**** | **2.17185e+07 N/m^2** | | ****Compressive strength:**** | **2.99922e+07 N/m^2** | | ****Elastic modulus:**** | **3e+11 N/m^2** | | ****Poisson's ratio:**** | **0.22** | | ****Mass density:**** | **2,075.99 kg/m^3** | | ****Thermal expansion coefficient:**** | **8e-06 /Kelvin** | | **SolidBody 1(Split Line1)(4.5tplate\_test-1)** | | | | | | **Curve Data:N/A** | | | | | | | |

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| **Loads and Fixtures**  | ****Fixture name**** | ****Fixture Image**** | ****Fixture Details**** | | --- | --- | --- | | **Fixed-1** |  | |  |  | | --- | --- | | Entities: | **2 face(s)** | | Type: | **Fixed Geometry** | | | ****Resultant Forces****   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Components** | **X** | **Y** | **Z** | **Resultant** | | **Reaction force(N)** | **2.38419e-06** | **486** | **-6.41346e-05** | **486** | | **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: | **486 N** | | |

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| Connector Definitions No Data |

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| Contact Information  | Contact | Contact Image | Contact Properties | | --- | --- | --- | | Contact Set-1 |  | |  |  | | --- | --- | | Type: | **Bonded contact pair** | | Entities: | **2 face(s)** | | | ****Contact/Friction force****   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Components** | **X** | **Y** | **Z** | **Resultant** | | **Contact Force(N)** | **0** | **-0.85444** | **0** | **0.85444** | | | | | Contact Set-2 |  | |  |  | | --- | --- | | Type: | **Bonded contact pair** | | Entities: | **10 face(s)** | | | ****Contact/Friction force****   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Components** | **X** | **Y** | **Z** | **Resultant** | | **Contact Force(N)** | **-4.4104E-06** | **0.86302** | **-1.3545E-08** | **0.86302** | | | | | Global Contact |  | |  |  | | --- | --- | | Type: | **Bonded** | | Components: | **1 component(s)** | | Options: | **Compatible mesh** | | | Component Contact-2 |  | |  |  | | --- | --- | | Type: | **No penetration (Surface to surface)** | | Components: | **4 Solid Body (s)** | | |

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| Mesh information  |  |  | | --- | --- | | Mesh type | Solid Mesh | | Mesher Used: | Standard mesh | | Automatic Transition: | Off | | Include Mesh Auto Loops: | Off | | Jacobian points | 4 Points | | Element Size | 0.2 in | | Tolerance | 0.01 in | | Mesh Quality Plot | High | | Remesh failed parts with incompatible mesh | Off |  Mesh information - Details  |  |  | | --- | --- | | Total Nodes | 41049 | | Total Elements | 21582 | | Maximum Aspect Ratio | 99.606 | | % of elements with Aspect Ratio < 3 | 27.1 | | % of elements with Aspect Ratio > 10 | 33.7 | | % of distorted elements(Jacobian) | 0 | | Time to complete mesh(hh;mm;ss): | 00:00:08 | | Computer name: |  | |  | | |

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| Sensor Details  | Sensor name | Location | Sensor Details | | --- | --- | --- | | Stress1 |  | Value : 1.176e+07 N/m^2  Entities :1 face(s)  Result :Stress  Component :VON: von Mises Stress  Criterion :Max over Selected Entities  Step Criterion : Across all Steps  Step No.:1  Alert Value: NA | |

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| Resultant ForcesReaction forces  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N | 2.38419e-06 | 486 | -6.41346e-05 | 486 |  Reaction Moments  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N.m | 0 | 0 | 0 | 0 | |
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| Beams No Data |

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| Study Results  | Name | Type | Min | Max | | --- | --- | --- | --- | | Displacement1 | URES: Resultant Displacement | 0.000e+00 mm  Node: 7040 | 2.007e-02 mm  Node: 769 | | **panel\_assembly\_test4.5-Static 1-Displacement-Displacement1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Strain1 | ESTRN: Equivalent Strain | 1.238e-09  Element: 4512 | 1.584e-04  Element: 13934 | | **panel\_assembly\_test4.5-Static 1-Strain-Strain1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Factor of Safety1 | Mohr-Coulomb Stress | 2.039e+00  Node: 35507 | 1.301e+06  Node: 14818 | | **panel\_assembly\_test4.5-Static 1-Factor of Safety-Factor of Safety1** | | | | |

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| Conclusion |

