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|  | |  | | --- | | **Simulation of ziplineZipper**  **Date: June 13, 2015 Designer: Solidworks**  **Study name: Static 1**  **Analysis type: Static** | | Table of Contents  [Description 1](#_Toc421991762)  [Assumptions 2](#_Toc421991763)  [Model Information 2](#_Toc421991764)  [Study Properties 3](#_Toc421991765)  [Units 4](#_Toc421991766)  [Material Properties 5](#_Toc421991767)  [Loads and Fixtures 6](#_Toc421991768)  [Connector Definitions 7](#_Toc421991769)  [Contact Information 8](#_Toc421991770)  [Mesh Information 9](#_Toc421991771)  [Sensor Details 10](#_Toc421991772)  [Resultant Forces 10](#_Toc421991773)  [Beams 10](#_Toc421991774)  [Study Results 11](#_Toc421991775)  [Conclusion 13](#_Toc421991776) | |
| Description No Data |

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| Assumptions |

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| Model Information  |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  | | --- | |  |   ****Model name:** ziplineZipper**  ****Current Configuration:** Default** | | | | | ****Solid Bodies**** | | | | | ****Document Name and Reference**** | ****Treated As**** | ****Volumetric Properties**** | ****Document Path/Date Modified**** | | **Cut-Extrude2** | **Solid Body** | ****Mass:0.0403131 kg****  ****Volume:3.95226e-005 m^3****  ****Density:1020 kg/m^3****  ****Weight:0.395068 N**** | ****C:\Users\Scott\Documents\2nd year\ENPH 253\peta\mech\zipLine\ziplineRoller.SLDPRT****  **Jun 13 16:59:09 2015** | | **Boss-Extrude1** | **Solid Body** | ****Mass:0.0104596 kg****  ****Volume:1.32904e-006 m^3****  ****Density:7870 kg/m^3****  ****Weight:0.102504 N**** | ****C:\Users\Scott\Documents\2nd year\ENPH 253\peta\mech\zipLine\ziplineZipperAxel.SLDPRT****  **Jun 13 16:59:10 2015** | | **Boss-Extrude1** | **Solid Body** | ****Mass:0.0104596 kg****  ****Volume:1.32904e-006 m^3****  ****Density:7870 kg/m^3****  ****Weight:0.102504 N**** | ****C:\Users\Scott\Documents\2nd year\ENPH 253\peta\mech\zipLine\ziplineZipperAxel.SLDPRT****  **Jun 13 16:59:10 2015** | |

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| Study Properties  |  |  | | --- | --- | | Study name | Static 1 | | Analysis type | Static | | Mesh type | Mixed 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\Scott\Documents\2nd year\ENPH 253\peta\mech\zipLine) | |

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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:**** | **5052-H34** | | ****Model type:**** | **Linear Elastic Isotropic** | | ****Default failure criterion:**** | **Unknown** | | ****Yield strength:**** | **2.15e+008 N/m^2** | | ****Tensile strength:**** | **2.6e+008 N/m^2** | | ****Elastic modulus:**** | **7e+010 N/m^2** | | ****Poisson's ratio:**** | **0.33** | | ****Mass density:**** | **2680 kg/m^3** | | ****Shear modulus:**** | **2.59e+010 N/m^2** | | ****Thermal expansion coefficient:**** | **2.4e-005 /Kelvin** | | **SolidBody 1(Cut-Extrude1)(ziplineCBracket-1),**  **SolidBody 1(Cut-Extrude1)(ziplineWinchBracket-1)** | | **Curve Data:N/A** | | | |  | |  |  | | --- | --- | | ****Name:**** | **ABS** | | ****Model type:**** | **Linear Elastic Isotropic** | | ****Default failure criterion:**** | **Unknown** | | ****Tensile strength:**** | **3e+007 N/m^2** | | ****Elastic modulus:**** | **2e+009 N/m^2** | | ****Poisson's ratio:**** | **0.394** | | ****Mass density:**** | **1020 kg/m^3** | | ****Shear modulus:**** | **3.189e+008 N/m^2** | | **SolidBody 1(Cut-Extrude2)(ziplineRoller-1)** | | **Curve Data:N/A** | | | |  | |  |  | | --- | --- | | ****Name:**** | **AISI 1020 Steel, Cold Rolled** | | ****Model type:**** | **Linear Elastic Isotropic** | | ****Default failure criterion:**** | **Unknown** | | ****Yield strength:**** | **3.5e+008 N/m^2** | | ****Tensile strength:**** | **4.2e+008 N/m^2** | | ****Elastic modulus:**** | **2.05e+011 N/m^2** | | ****Poisson's ratio:**** | **0.29** | | ****Mass density:**** | **7870 kg/m^3** | | ****Shear modulus:**** | **8e+010 N/m^2** | | ****Thermal expansion coefficient:**** | **1.2e-005 /Kelvin** | | **SolidBody 1(Boss-Extrude1)(ziplineZipperAxel-1),**  **SolidBody 1(Boss-Extrude1)(ziplineZipperAxel-2)** | | **Curve Data:N/A** | | | |

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| **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)** | **4.91599e-006** | **44.145** | **1.64844e-007** | **44.145** | | **Reaction Moment(N.m)** | **0** | **0** | **0** | **1e-033** | | | |  | ****Load name**** | ****Load Image**** | ****Load Details**** | | --- | --- | --- | | **BearingLoads-1** |  | |  |  | | --- | --- | | Entities: | **1 face(s)** | | Coordinate System: | **Coordinate System1** | | Force Values: | **0 -44.145 0 N** | | |

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| Connector Definitions  | ****Connector name**** | ****Connector Details**** | ****Connector Image**** | | --- | --- | --- | | **Rigid Connector-1** | |  |  | | --- | --- | | Entities: | **2 face(s)** | | Type: | **Rigid** | | |  | | --- | |  | | **Rigid Connector-1** | | | **Rigid Connector-2** | |  |  | | --- | --- | | Entities: | **2 face(s)** | | Type: | **Rigid** | | |  | | --- | |  | | **Rigid Connector-2** | | | **Rigid Connector-3** | |  |  | | --- | --- | | Entities: | **3 face(s)** | | Type: | **Rigid** | | |  | | --- | |  | | **Rigid Connector-3** | | | **Rigid Connector-4** | |  |  | | --- | --- | | Entities: | **2 face(s)** | | Type: | **Rigid** | | |  | | --- | |  | | **Rigid Connector-4** | | | **Rigid Connector-5** | |  |  | | --- | --- | | Entities: | **2 face(s)** | | Type: | **Rigid** | | |  | | --- | |  | | **Rigid Connector-5** | | |

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| Contact Information  | Contact | Contact Image | Contact Properties | | --- | --- | --- | | Global Contact |  | |  |  | | --- | --- | | Type: | **Bonded** | | Components: | **1 component(s)** | | Options: | **Compatible mesh** | | |

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| Mesh Information  |  |  | | --- | --- | | Mesh type | Mixed Mesh | | Mesher Used: | Standard mesh | | Automatic Transition: | Off | | Include Mesh Auto Loops: | Off | | Jacobian points | 4 Points | | Jacobian check for shell | Off | | Element Size | 3.69528 mm | | Tolerance | 0.184764 mm | | Mesh Quality | High | | Remesh failed parts with incompatible mesh | Off |  Mesh Information - Details  |  |  | | --- | --- | | Total Nodes | 18103 | | Total Elements | 9993 | | Time to complete mesh(hh;mm;ss): | 00:00:07 | | Computer name: | HP-PC | |  | | |

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| Sensor Details No Data |

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| Resultant ForcesReaction Forces  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N | 4.91599e-006 | 44.145 | 1.64844e-007 | 44.145 |  Reaction Moments  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N.m | 0 | 0 | 0 | 1e-033 | |
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| Study Results  | Name | Type | Min | Max | | --- | --- | --- | --- | | Stress1 | VON: von Mises Stress | 0.00111129 N/m^2  Node: 9772 | 4.98607e+006 N/m^2  Node: 11486 | | **ziplineZipper-Static 1-Stress-Stress1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Displacement1 | URES: Resultant Displacement | 0 mm  Node: 1 | 0.00986354 mm  Node: 12622 | | **ziplineZipper-Static 1-Displacement-Displacement1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Strain1 | ESTRN: Equivalent Strain | 3.19753e-014  Element: 6146 | 0.000226053  Element: 1951 | | **ziplineZipper-Static 1-Strain-Strain1** | | | |  | Name | Type | | --- | --- | | Displacement1{1} | Deformed Shape | | **ziplineZipper-Static 1-Displacement-Displacement1{1}** | | |

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| Conclusion |