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|  | |  | | --- | | **Simulation of stair case assembly**  **Date: 07 April 2022 Designer: P.JEEVANKUMAR**  **Study name: Static 1**  **Analysis type: Static** | | Table of Contents  [Model Information 2](#_Toc100219303)  [Study Properties 5](#_Toc100219304)  [Units 5](#_Toc100219305)  [Material Properties 6](#_Toc100219306)  [Loads and Fixtures 7](#_Toc100219307)  [Connector Definitions 8](#_Toc100219308)  [Contact Information 8](#_Toc100219309)  [Mesh information 9](#_Toc100219310)  [Sensor Details 10](#_Toc100219311)  [Resultant Forces 10](#_Toc100219312)  [Beams 10](#_Toc100219313)  [Study Results 11](#_Toc100219314)  [Conclusion 13](#_Toc100219315) | |
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| Model Information  |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  | | --- | |  |   ****Model name:** stair case assembly**  ****Current Configuration:** Default** | | | | | ****Solid Bodies**** | | | | | ****Document Name and Reference**** | ****Treated As**** | ****Volumetric Properties**** | ****Document Path/Date Modified**** | | **LPattern1** | **Solid Body** | ****Mass:132.354 kg****  ****Volume:0.0490199 m^3****  ****Density:2,700 kg/m^3****  ****Weight:1,297.07 N**** | ****C:\Users\JEEVAN\OneDrive\Desktop\preeti proj\link.SLDPRT****  **Apr 7 10:19:59 2022** | | **LPattern1** | **Solid Body** | ****Mass:132.354 kg****  ****Volume:0.0490199 m^3****  ****Density:2,700 kg/m^3****  ****Weight:1,297.07 N**** | ****C:\Users\JEEVAN\OneDrive\Desktop\preeti proj\link.SLDPRT****  **Apr 7 10:19:59 2022** | | **Boss-Extrude1** | **Solid Body** | ****Mass:6.46351 kg****  ****Volume:0.00239389 m^3****  ****Density:2,700 kg/m^3****  ****Weight:63.3424 N**** | ****C:\Users\JEEVAN\OneDrive\Desktop\preeti proj\loked lever.SLDPRT****  **Apr 7 10:19:59 2022** | | **Boss-Extrude2** | **Solid Body** | ****Mass:117.699 kg****  ****Volume:0.0435921 m^3****  ****Density:2,700 kg/m^3****  ****Weight:1,153.45 N**** | ****C:\Users\JEEVAN\OneDrive\Desktop\preeti proj\step.SLDPRT****  **Apr 7 10:19:59 2022** | | **Boss-Extrude2** | **Solid Body** | ****Mass:117.699 kg****  ****Volume:0.0435921 m^3****  ****Density:2,700 kg/m^3****  ****Weight:1,153.45 N**** | ****C:\Users\JEEVAN\OneDrive\Desktop\preeti proj\step.SLDPRT****  **Apr 7 10:19:59 2022** | | **Boss-Extrude2** | **Solid Body** | ****Mass:117.699 kg****  ****Volume:0.0435921 m^3****  ****Density:2,700 kg/m^3****  ****Weight:1,153.45 N**** | ****C:\Users\JEEVAN\OneDrive\Desktop\preeti proj\step.SLDPRT****  **Apr 7 10:19:59 2022** | | **Boss-Extrude2** | **Solid Body** | ****Mass:117.699 kg****  ****Volume:0.0435921 m^3****  ****Density:2,700 kg/m^3****  ****Weight:1,153.45 N**** | ****C:\Users\JEEVAN\OneDrive\Desktop\preeti proj\step.SLDPRT****  **Apr 7 10:19:59 2022** | | **Boss-Extrude2** | **Solid Body** | ****Mass:117.699 kg****  ****Volume:0.0435921 m^3****  ****Density:2,700 kg/m^3****  ****Weight:1,153.45 N**** | ****C:\Users\JEEVAN\OneDrive\Desktop\preeti proj\step.SLDPRT****  **Apr 7 10:19:59 2022** | | **Boss-Extrude2** | **Solid Body** | ****Mass:117.699 kg****  ****Volume:0.0435921 m^3****  ****Density:2,700 kg/m^3****  ****Weight:1,153.45 N**** | ****C:\Users\JEEVAN\OneDrive\Desktop\preeti proj\step.SLDPRT****  **Apr 7 10:19:59 2022** | | **Boss-Extrude2** | **Solid Body** | ****Mass:117.699 kg****  ****Volume:0.0435921 m^3****  ****Density:2,700 kg/m^3****  ****Weight:1,153.45 N**** | ****C:\Users\JEEVAN\OneDrive\Desktop\preeti proj\step.SLDPRT****  **Apr 7 10:19:59 2022** | | **Boss-Extrude2** | **Solid Body** | ****Mass:117.699 kg****  ****Volume:0.0435921 m^3****  ****Density:2,700 kg/m^3****  ****Weight:1,153.45 N**** | ****C:\Users\JEEVAN\OneDrive\Desktop\preeti proj\step.SLDPRT****  **Apr 7 10:19:59 2022** | | **Boss-Extrude2** | **Solid Body** | ****Mass:117.699 kg****  ****Volume:0.0435921 m^3****  ****Density:2,700 kg/m^3****  ****Weight:1,153.45 N**** | ****C:\Users\JEEVAN\OneDrive\Desktop\preeti proj\step.SLDPRT****  **Apr 7 10:19:59 2022** | | **Boss-Extrude2** | **Solid Body** | ****Mass:117.699 kg****  ****Volume:0.0435921 m^3****  ****Density:2,700 kg/m^3****  ****Weight:1,153.45 N**** | ****C:\Users\JEEVAN\OneDrive\Desktop\preeti proj\step.SLDPRT****  **Apr 7 10:19:59 2022** | |

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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\JEEVAN\OneDrive\Desktop\preeti proj) | |

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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:**** | **6063-T83** | | ****Model type:**** | **Linear Elastic Isotropic** | | ****Default failure criterion:**** | **Max von Mises Stress** | | ****Yield strength:**** | **2.4e+08 N/m^2** | | ****Tensile strength:**** | **2.55e+08 N/m^2** | | ****Elastic modulus:**** | **6.9e+10 N/m^2** | | ****Poisson's ratio:**** | **0.33** | | ****Mass density:**** | **2,700 kg/m^3** | | ****Shear modulus:**** | **2.58e+10 N/m^2** | | ****Thermal expansion coefficient:**** | **2.34e-05 /Kelvin** | | **SolidBody 1(LPattern1)(link-1),**  **SolidBody 1(LPattern1)(link-2),**  **SolidBody 1(Boss-Extrude1)(loked lever-1),**  **SolidBody 1(Boss-Extrude2)(step-1),**  **SolidBody 1(Boss-Extrude2)(step-11),**  **SolidBody 1(Boss-Extrude2)(step-2),**  **SolidBody 1(Boss-Extrude2)(step-3),**  **SolidBody 1(Boss-Extrude2)(step-4),**  **SolidBody 1(Boss-Extrude2)(step-5),**  **SolidBody 1(Boss-Extrude2)(step-6),**  **SolidBody 1(Boss-Extrude2)(step-7),**  **SolidBody 1(Boss-Extrude2)(step-8),**  **SolidBody 1(Boss-Extrude2)(step-9)** | | **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)** | **7.92236** | **18,132.6** | **-5.18799** | **18,132.6** | | **Reaction Moment(N.m)** | **0** | **0** | **0** | **0** | | | |  | ****Load name**** | ****Load Image**** | ****Load Details**** | | --- | --- | --- | | **Distributed Mass-1** |  | |  |  | | --- | --- | | Entities: | **10 face(s)** | | Type: | **Displacement (Direct transfer)** | | Coordinate System: | **Global cartesian coordinates** | | Translation Values: | **---, ---, --- mm** | | Rotation Values: | **---, ---, --- deg** | | Reference coordinates: | **0 0 0 mm** | | Remote Mass: | **400 kg** | | Moment of Inertia: | **0,0,0,0,0,0 kg.m^2** | | Components transferred: | **NA** | | | **Gravity-1** |  | |  |  | | --- | --- | | Reference: | **Face< 1 >** | | Values: | **0 0 9.81** | | Units: | **m/s^2** | | |

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| Connector Definitions No Data |

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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 | Solid Mesh | | Mesher Used: | Standard mesh | | Automatic Transition: | Off | | Include Mesh Auto Loops: | Off | | Jacobian points | 4 Points | | Element Size | 1.9685 in | | Tolerance | 0.0984252 in | | Mesh Quality Plot | High | | Remesh failed parts with incompatible mesh | Off |  Mesh information - Details  |  |  | | --- | --- | | Total Nodes | 69044 | | Total Elements | 40788 | | Maximum Aspect Ratio | 27.827 | | % of elements with Aspect Ratio < 3 | 93.4 | | % of elements with Aspect Ratio > 10 | 1.19 | | % of distorted elements(Jacobian) | 0 | | Time to complete mesh(hh;mm;ss): | 00:00:06 | | Computer name: |  | |  | | |

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| Resultant ForcesReaction forces  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N | 7.92236 | 18,132.6 | -5.18799 | 18,132.6 |  Reaction Moments  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N.m | 0 | 0 | 0 | 0 | |
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| Study Results  | Name | Type | Min | Max | | --- | --- | --- | --- | | Stress1 | VON: von Mises Stress | 1.946e+03 N/m^2  Node: 38187 | 6.210e+08 N/m^2  Node: 477 | | **stair case assembly-Static 1-Stress-Stress1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Displacement1 | URES: Resultant Displacement | 0.000e+00 mm  Node: 121 | 3.954e+01 mm  Node: 9741 | | **stair case assembly-Static 1-Displacement-Displacement1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Strain1 | ESTRN: Equivalent Strain | 1.842e-08  Element: 12821 | 4.666e-03  Element: 2527 | | **stair case assembly-Static 1-Strain-Strain1** | | | | |

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| Conclusion |