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|  | |  | | --- | | **Simulation of TU23FL-CAD-HW4.3**  **Date: Monday, October 2, 2023 Designer: Jakob Werle**  **Study name: Jakob Werle**  **Analysis type: Static** | | Table of Contents  [Description 1](#_Toc147103692)  [Assumptions 2](#_Toc147103693)  [Model Information 3](#_Toc147103694)  [Study Properties 5](#_Toc147103695)  [Units 6](#_Toc147103696)  [Material Properties 6](#_Toc147103697)  [Loads and Fixtures 7](#_Toc147103698)  [Connector Definitions 8](#_Toc147103699)  [Interaction Information 8](#_Toc147103700)  [Mesh information 8](#_Toc147103701)  [Sensor Details 8](#_Toc147103702)  [Resultant Forces 9](#_Toc147103703)  [Beams 10](#_Toc147103704)  [Study Results 11](#_Toc147103705)  [Conclusion 14](#_Toc147103706) | |
| Description No Data |

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| Assumptions |

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| Model Information  |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  | | --- | |  |   ****Model name:** TU23FL-CAD-HW4.3**  ****Current Configuration:** Default** | | | | | ****Beam Bodies:**** | | | | | ****Document Name and Reference**** | ****Formulation**** | ****Properties**** | ****Document Path/Date Modified**** | | **SolidBody 7(Boss-Extrude1)** | **Beam – Uniform C/S** | ****Section Standard-Custom****  ****Section Area: 0.697501in^2****  ****Length:98.4252in****  ****Volume:68.6517in^3****  ****Mass Density:0.101518lb/in^3****  ****Mass:6.96936lb****  ****Weight:6.96464lbf**** | ****C:\Users\jakob\software\TU\23FL\CAD\HW4.3\TU23FL-CAD-HW4.3.SLDPRT****  **Oct 2 01:46:33 2023** | | **SolidBody 11(Boss-Extrude9)** | **Beam – Uniform C/S** | ****Section Standard-Custom****  ****Section Area: 0.697501in^2****  ****Length:98.4252in****  ****Volume:68.6517in^3****  ****Mass Density:0.101518lb/in^3****  ****Mass:6.96936lb****  ****Weight:6.96464lbf**** | ****C:\Users\jakob\software\TU\23FL\CAD\HW4.3\TU23FL-CAD-HW4.3.SLDPRT****  **Oct 2 01:46:33 2023** | | **SolidBody 13(Boss-Extrude10)** | **Beam – Uniform C/S** | ****Section Standard-Custom****  ****Section Area: 0.697501in^2****  ****Length:118.11in****  ****Volume:82.3821in^3****  ****Mass Density:0.101518lb/in^3****  ****Mass:8.36324lb****  ****Weight:8.35756lbf**** | ****C:\Users\jakob\software\TU\23FL\CAD\HW4.3\TU23FL-CAD-HW4.3.SLDPRT****  **Oct 2 01:46:33 2023** | | **SolidBody 14(Boss-Extrude8)** | **Beam – Uniform C/S** | ****Section Standard-Custom****  ****Section Area: 0.697501in^2****  ****Length:78.7402in****  ****Volume:54.9214in^3****  ****Mass Density:0.101518lb/in^3****  ****Mass:5.57549lb****  ****Weight:5.57171lbf**** | ****C:\Users\jakob\software\TU\23FL\CAD\HW4.3\TU23FL-CAD-HW4.3.SLDPRT****  **Oct 2 01:46:33 2023** | |

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| Study Properties  |  |  | | --- | --- | | Study name | Jakob Werle | | Analysis type | Static | | Mesh type | Beam Mesh | | Solver type | Automatic | | Inplane Effect: | Off | | Soft Spring: | Off | | Inertial Relief: | Off | | Incompatible bonding options | Automatic | | Large displacement | Off | | Compute free body forces | On | | Result folder | SOLIDWORKS document (C:\Users\jakob\software\TU\23FL\CAD\HW4.3) | |

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| Units  |  |  | | --- | --- | | Unit system: | English (IPS) | | Length/Displacement | in | | Temperature | Fahrenheit | | Angular velocity | Hertz | | Pressure/Stress | psi | |

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| Material Properties  |  |  |  | | --- | --- | --- | | ****Model Reference**** | ****Properties**** | ****Components**** | |  | |  |  | | --- | --- | | ****Name:**** | **7075-T6 (SN)** | | ****Model type:**** | **Linear Elastic Isotropic** | | ****Default failure criterion:**** | **Unknown** | | ****Yield strength:**** | **73,244.1 psi** | | ****Tensile strength:**** | **82,671.5 psi** | | ****Elastic modulus:**** | **1.04427e+07 psi** | | ****Poisson's ratio:**** | **0.33** | | ****Mass density:**** | **0.101518 lb/in^3** | | ****Shear modulus:**** | **3.90152e+06 psi** | | ****Thermal expansion coefficient:**** | **1.31111e-05 /Fahrenheit** | | **SolidBody 7(Boss-Extrude1)(TU23FL-CAD-HW4.3),**  **SolidBody 11(Boss-Extrude9)(TU23FL-CAD-HW4.3),**  **SolidBody 13(Boss-Extrude10)(TU23FL-CAD-HW4.3),**  **SolidBody 14(Boss-Extrude8)(TU23FL-CAD-HW4.3)** | | **Curve Data:N/A** | | | |

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| **Loads and Fixtures**  | ****Fixture name**** | ****Fixture Image**** | ****Fixture Details**** | | --- | --- | --- | | **Reference Geometry-5** |  | |  |  | | --- | --- | | Entities: | **3 Joint(s)** | | Reference: | **Front Plane** | | Type: | **Use reference geometry** | | Translation: | **---, ---, 0** | | Rotation: | **0, 0, ---** | | Units: | **in, rad** | | | **Reference Geometry-2** |  | |  |  | | --- | --- | | Entities: | **1 Joint(s)** | | Reference: | **Front Plane** | | Type: | **Use reference geometry** | | Translation: | **0, 0, 0** | | Rotation: | **0, 0, ---** | | Units: | **in, rad** | | | **Reference Geometry-6** |  | |  |  | | --- | --- | | Entities: | **1 Joint(s)** | | Reference: | **Plane1** | | Type: | **Use reference geometry** | | Translation: | **0, 0, ---** | | Rotation: | **---, 0, 0** | | Units: | **in, rad** | |  | ****Load name**** | ****Load Image**** | ****Load Details**** | | --- | --- | --- | | **Force-3** |  | |  |  | | --- | --- | | Entities: | **1 vertex(s), 1 plane(s)** | | Reference: | **Front Plane** | | Type: | **Apply force** | | Values: | **---, -,750, --- lbf** | | Moments: | **---, ---, --- lbf.in** | | | **Force-4** |  | |  |  | | --- | --- | | Entities: | **1 plane(s), 1 Beam (s)** | | Reference: | **Plane1** | | Type: | **Apply force** | | Values: | **---, -,300, --- N/m** | | Moments: | **---, ---, --- N·m/m** | | |

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| Connector Definitions No Data |

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| Interaction Information No Data |

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| Mesh information  |  |  | | --- | --- | | Mesh type | Beam Mesh |  Mesh information - Details  |  |  | | --- | --- | | Total Nodes | 229 | | Total Elements | 224 | | Time to complete mesh(hh;mm;ss): | 00:00:01 | | Computer name: | JW-MACHINE | |

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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 | lbf | -121.397 | 911.862 | 0 | 919.908 |  Reaction Moments  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | lbf.in | -221.457 | -1.32848e-12 | 0 | 221.457 | |
| Free body forces  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | lbf | 0 | 0 | 0 | 0 |  Free body moments  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | lbf.in | 0 | 0 | 0 | 0 | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| BeamsBeam Forces  | Beam Name | Joints | Axial(lbf) | Shear1(lbf) | Shear2(lbf) | Moment1(lbf.in) | Moment2(lbf.in) | Torque(lbf.in) | | --- | --- | --- | --- | --- | --- | --- | --- | | Beam-6(Boss-Extrude1) | 1 | -104.767 | 610.31 | -8.69516e-20 | 5.60302e-20 | -8.26357e-07 | 1.23762e-21 | | 2 | 104.767 | -610.31 | 8.88931e-20 | -8.70982e-18 | -60,069.9 | 5.55278e-19 | | Beam-10(Boss-Extrude9) | 1 | -104.767 | -139.69 | 2.10945e-20 | 8.75289e-18 | 60,069.9 | 5.56229e-19 | | 2 | 104.767 | 139.69 | -1.91535e-20 | -6.77227e-18 | -46,320.9 | 4.29424e-19 | | Beam-12(Boss-Extrude10) | 1 | 4.81946e-06 | 376.94 | 0 | 0 | 5.84301e-07 | 0 | | 2 | 0.000737984 | -174.612 | 0 | 0 | 32,572 | 0 | | Beam-13(Boss-Extrude8) | 1 | 0.00045084 | -174.612 | 3.20442e-13 | 8.70298e-11 | 46,320.9 | 6.63914e-12 | | 2 | -0.000743724 | 174.612 | -3.70373e-13 | -7.11121e-11 | -32,572 | 5.47347e-12 |  Beam Stresses  | Beam Name | Joints | Axial(psi) | Bending Dir1(psi) | Bending Dir2(psi) | Torsional (psi) | Upper bound axial and bending(psi) | | --- | --- | --- | --- | --- | --- | --- | | Beam-6(Boss-Extrude1) | 1 | -150.204 | 8.16152e-19 | 6.01847e-06 | 1.46804e-20 | 150.204 | | 2 | -150.204 | 1.2687e-16 | -437,498 | -6.58659e-18 | 437,648 | | Beam-10(Boss-Extrude9) | 1 | -150.204 | 1.27497e-16 | -437,498 | 6.59787e-18 | 437,648 | | 2 | -150.204 | 9.86467e-17 | -337,362 | -5.09374e-18 | 337,512 | | Beam-12(Boss-Extrude10) | 1 | -6.90961e-06 | 0 | 4.25554e-06 | 0 | 1.11652e-05 | | 2 | 0.00105804 | 0 | -237,226 | 0 | 237,226 | | Beam-13(Boss-Extrude8) | 1 | 0.000646364 | 1.2677e-09 | -337,362 | 7.87521e-11 | 337,362 | | 2 | 0.00106627 | 1.03584e-09 | -237,226 | -6.49251e-11 | 237,226 | |

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| Study Results  | Name | Type | Min | Max | | --- | --- | --- | --- | | Stress1 | Upper bound axial and bending | 4,820.158psi  Element: 113 | 437,647.813psi  Element: 1 | | **TU23FL-CAD-HW4.3-Jakob Werle-Stress-Stress1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Displacement1 | URES: Resultant Displacement | 0.000in  Node: 57 | 1,062.310in  Node: 62 | | **TU23FL-CAD-HW4.3-Jakob Werle-Displacement-Displacement1** | | | |  | Name | Type | | --- | --- | | Shear-Moment Plot1 | Shear Force in Dir1 | | **TU23FL-CAD-HW4.3-Jakob Werle-Shear-Moment Plot-Shear-Moment Plot1** | |  | Name | Type | | --- | --- | | Shear-Moment Plot2 | Moment about Dir2 | | **TU23FL-CAD-HW4.3-Jakob Werle-Shear-Moment Plot-Shear-Moment Plot2** | | |

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| Conclusion |

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| TU23FL-CAD-HW4.3 | |
| Stress\_max [Kpi] | 437.6 |
| F\_Ax [lbf] | 466 |
| F\_Ay [lbf] | 2710 |
| F\_Ex [lbf] | -1010 |
| F\_Ey [lbf] | 1340 |

A diagram of a mathematical equation

Description automatically generated with medium confidence