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|  | |  | | --- | | **Simulation of TU23FL-CAD-HW4.2**  **Date: Monday, October 2, 2023 Designer: Jakob Werle**  **Study name: Jakob Werle**  **Analysis type: Static** | | Table of Contents  [Description 1](#_Toc147101481)  [Assumptions 2](#_Toc147101482)  [Model Information 3](#_Toc147101483)  [Study Properties 5](#_Toc147101484)  [Units 6](#_Toc147101485)  [Material Properties 6](#_Toc147101486)  [Loads and Fixtures 7](#_Toc147101487)  [Connector Definitions 8](#_Toc147101488)  [Interaction Information 8](#_Toc147101489)  [Mesh information 8](#_Toc147101490)  [Sensor Details 8](#_Toc147101491)  [Resultant Forces 9](#_Toc147101492)  [Beams 10](#_Toc147101493)  [Study Results 11](#_Toc147101494)  [Conclusion 14](#_Toc147101495) | |
| Description No Data |

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| Assumptions |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| Model Information  |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  | | --- | |  |   ****Model name:** TU23FL-CAD-HW4.2**  ****Current Configuration:** Default** | | | | | ****Beam Bodies:**** | | | | | ****Document Name and Reference**** | ****Formulation**** | ****Properties**** | ****Document Path/Date Modified**** | | **SolidBody 6(Boss-Extrude5)** | **Beam – Uniform C/S** | ****Section Standard-Custom****  ****Section Area: 6in^2****  ****Length:48in****  ****Volume:288in^3****  ****Mass Density:0.101518lb/in^3****  ****Mass:29.2371lb****  ****Weight:29.2173lbf**** | ****C:\Users\jakob\software\TU\23FL\CAD\HW4.2\TU23FL-CAD-HW4.2.SLDPRT****  **Oct 2 01:03:28 2023** | | **SolidBody 7(Boss-Extrude1)** | **Beam – Uniform C/S** | ****Section Standard-Custom****  ****Section Area: 6in^2****  ****Length:48in****  ****Volume:288in^3****  ****Mass Density:0.101518lb/in^3****  ****Mass:29.2371lb****  ****Weight:29.2173lbf**** | ****C:\Users\jakob\software\TU\23FL\CAD\HW4.2\TU23FL-CAD-HW4.2.SLDPRT****  **Oct 2 01:03:28 2023** | | **SolidBody 8(Boss-Extrude6)** | **Beam – Uniform C/S** | ****Section Standard-Custom****  ****Section Area: 6in^2****  ****Length:60in****  ****Volume:360in^3****  ****Mass Density:0.101518lb/in^3****  ****Mass:36.5464lb****  ****Weight:36.5216lbf**** | ****C:\Users\jakob\software\TU\23FL\CAD\HW4.2\TU23FL-CAD-HW4.2.SLDPRT****  **Oct 2 01:03:28 2023** | | **SolidBody 9(Boss-Extrude7)** | **Beam – Uniform C/S** | ****Section Standard-Custom****  ****Section Area: 6in^2****  ****Length:60in****  ****Volume:360in^3****  ****Mass Density:0.101518lb/in^3****  ****Mass:36.5464lb****  ****Weight:36.5216lbf**** | ****C:\Users\jakob\software\TU\23FL\CAD\HW4.2\TU23FL-CAD-HW4.2.SLDPRT****  **Oct 2 01:03:28 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\HW4.2) | |

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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 6(Boss-Extrude5)(TU23FL-CAD-HW4.2),**  **SolidBody 7(Boss-Extrude1)(TU23FL-CAD-HW4.2),**  **SolidBody 8(Boss-Extrude6)(TU23FL-CAD-HW4.2),**  **SolidBody 9(Boss-Extrude7)(TU23FL-CAD-HW4.2)** | | **Curve Data:N/A** | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Loads and Fixtures**  | ****Fixture name**** | ****Fixture Image**** | ****Fixture Details**** | | --- | --- | --- | | **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-1** |  | |  |  | | --- | --- | | Entities: | **4 Joint(s)** | | Reference: | **Front Plane** | | Type: | **Use reference geometry** | | Translation: | **---, ---, 0** | | Rotation: | **0, 0, ---** | | Units: | **mm, rad** | | | **Reference Geometry-3** |  | |  |  | | --- | --- | | Entities: | **1 Joint(s)** | | Reference: | **Front Plane** | | Type: | **Use reference geometry** | | Translation: | **---, 0, ---** | | Rotation: | **---, ---, ---** | | Units: | **in, rad** | |  | ****Load name**** | ****Load Image**** | ****Load Details**** | | --- | --- | --- | | **Force-1** |  | |  |  | | --- | --- | | Entities: | **1 plane(s), 1 Joint(s)** | | Reference: | **Front Plane** | | Type: | **Apply force** | | Values: | **---, -,450, --- lbf** | | Moments: | **---, ---, --- lbf.in** | | | **Force-2** |  | |  |  | | --- | --- | | Entities: | **1 plane(s), 1 Beam (s)** | | Reference: | **Front Plane** | | Type: | **Apply force** | | Values: | **---, -4.16667, --- lbf/in** | | Moments: | **---, ---, --- lbf·in/in** | | |

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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 | 51 | | Total Elements | 46 | | 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 | 7.21904e-33 | 700 | 0 | 700 |  Reaction Moments  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | lbf.in | 0 | 0 | 0 | 8.85075e-33 | |
| 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-5(Boss-Extrude5) | 1 | 0 | -459.375 | 0 | 0 | -450.001 | 0 | | 2 | 0 | 459.375 | 0 | 0 | 22,500 | 0 | | Beam-6(Boss-Extrude1) | 1 | 0 | -9.37502 | 0 | 0 | 1.73817e-10 | 0 | | 2 | 0 | 9.37502 | 0 | 0 | 450.001 | 0 | | Beam-7(Boss-Extrude6) | 1 | 1.764e-21 | 250 | 0 | 0 | -22,500 | 0 | | 2 | 1.76401e-21 | -250 | 0 | 0 | 7,500 | 0 | | Beam-8(Boss-Extrude7) | 1 | -2.91292e-32 | 2.38897e-07 | 0 | 0 | 1.56281e-07 | 0 | | 2 | 1.764e-21 | 250 | 0 | 0 | -7,500 | 0 |  Beam Stresses  | Beam Name | Joints | Axial(psi) | Bending Dir1(psi) | Bending Dir2(psi) | Torsional (psi) | Upper bound axial and bending(psi) | | --- | --- | --- | --- | --- | --- | --- | | Beam-5(Boss-Extrude5) | 1 | 0 | 0 | 150 | 0 | 150 | | 2 | 0 | 0 | 7,500 | 0 | 7,500 | | Beam-6(Boss-Extrude1) | 1 | 0 | 0 | -5.79389e-11 | 0 | 5.79389e-11 | | 2 | 0 | 0 | 150 | 0 | 150 | | Beam-7(Boss-Extrude6) | 1 | 2.94e-22 | 0 | 7,500 | 0 | 7,500 | | 2 | -2.94001e-22 | 0 | 2,500 | 0 | 2,500 | | Beam-8(Boss-Extrude7) | 1 | 0 | 0 | 5.20936e-08 | 0 | 5.20936e-08 | | 2 | 2.94e-22 | 0 | 2,500 | 0 | 2,500 | |

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| Study Results  | Name | Type | Min | Max | | --- | --- | --- | --- | | Stress1 | Upper bound axial and bending | 14.793psi  Element: 34 | 7,500.000psi  Element: 1 | | **TU23FL-CAD-HW4.2-Jakob Werle-Stress-Stress1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Displacement1 | URES: Resultant Displacement | 0.000in  Node: 1 | 3.142in  Node: 35 | | **TU23FL-CAD-HW4.2-Jakob Werle-Displacement-Displacement1** | | | |  | Name | Type | | --- | --- | | Shear-Moment Plot1 | Shear Force in Dir1 | | **TU23FL-CAD-HW4.2-Jakob Werle-Shear-Moment Plot-Shear-Moment Plot1** | |  | Name | Type | | --- | --- | | Shear-Moment Plot2 | Moment about Dir2 | | **TU23FL-CAD-HW4.2-Jakob Werle-Shear-Moment Plot-Shear-Moment Plot2** | | |

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| Conclusion |

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| TU23FL-CAD-HW4.2 | |
| Stress\_max [psi] | 7500 |
| F\_Ay [lbf] | -9.38 |
| F\_Cy [lbf] | 709 |

A close-up of math equations

Description automatically generated