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|  | |  | | --- | | **Simulation of TU23FL-CAD-HW4.1**  **Date: Monday, October 2, 2023 Designer: Jakob Werle**  **Study name: Jakob Werle**  **Analysis type: Static** | | Table of Contents  [Description 1](#_Toc147099474)  [Assumptions 2](#_Toc147099475)  [Model Information 3](#_Toc147099476)  [Study Properties 5](#_Toc147099477)  [Units 5](#_Toc147099478)  [Material Properties 6](#_Toc147099479)  [Loads and Fixtures 7](#_Toc147099480)  [Connector Definitions 8](#_Toc147099481)  [Interaction Information 8](#_Toc147099482)  [Mesh information 8](#_Toc147099483)  [Sensor Details 9](#_Toc147099484)  [Resultant Forces 9](#_Toc147099485)  [Beams 10](#_Toc147099486)  [Study Results 11](#_Toc147099487)  [Conclusion 14](#_Toc147099488) | |
| Description No Data |

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| Assumptions |

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| Model Information  |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  | | --- | |  |   ****Model name:** TU23FL-CAD-HW4.1**  ****Current Configuration:** Default** | | | | | ****Beam Bodies:**** | | | | | ****Document Name and Reference**** | ****Formulation**** | ****Properties**** | ****Document Path/Date Modified**** | | **SolidBody 1(Boss-Extrude2)** | **Beam – Uniform C/S** | ****Section Standard-Custom****  ****Section Area: 4.90874in^2****  ****Length:36in****  ****Volume:176.715in^3****  ****Mass Density:0.27818lb/in^3****  ****Mass:49.1585lb****  ****Weight:49.1252lbf**** | ****C:\Users\jakob\software\TU\23FL\CAD\HW4\TU23FL-CAD-HW4.1.SLDPRT****  **Oct 2 00:35:59 2023** | | **SolidBody 3(Boss-Extrude1)** | **Beam – Uniform C/S** | ****Section Standard-Custom****  ****Section Area: 4.90874in^2****  ****Length:36in****  ****Volume:176.715in^3****  ****Mass Density:0.27818lb/in^3****  ****Mass:49.1585lb****  ****Weight:49.1252lbf**** | ****C:\Users\jakob\software\TU\23FL\CAD\HW4\TU23FL-CAD-HW4.1.SLDPRT****  **Oct 2 00:35:59 2023** | | **SolidBody 4(Boss-Extrude3)** | **Beam – Uniform C/S** | ****Section Standard-Custom****  ****Section Area: 4.90874in^2****  ****Length:48in****  ****Volume:235.619in^3****  ****Mass Density:0.27818lb/in^3****  ****Mass:65.5447lb****  ****Weight:65.5002lbf**** | ****C:\Users\jakob\software\TU\23FL\CAD\HW4\TU23FL-CAD-HW4.1.SLDPRT****  **Oct 2 00:35:59 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) | |

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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:**** | **Alloy Steel** | | ****Model type:**** | **Linear Elastic Isotropic** | | ****Default failure criterion:**** | **Unknown** | | ****Yield strength:**** | **89,984.6 psi** | | ****Tensile strength:**** | **104,982 psi** | | ****Elastic modulus:**** | **3.04579e+07 psi** | | ****Poisson's ratio:**** | **0.28** | | ****Mass density:**** | **0.27818 lb/in^3** | | ****Shear modulus:**** | **1.1458e+07 psi** | | ****Thermal expansion coefficient:**** | **7.22222e-06 /Fahrenheit** | | **SolidBody 1(Boss-Extrude2)(TU23FL-CAD-HW4.1),**  **SolidBody 3(Boss-Extrude1)(TU23FL-CAD-HW4.1),**  **SolidBody 4(Boss-Extrude3)(TU23FL-CAD-HW4.1)** | | **Curve Data:N/A** | | | |

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| **Loads and Fixtures**  | ****Fixture name**** | ****Fixture Image**** | ****Fixture Details**** | | --- | --- | --- | | **Fixed-1** |  | |  |  | | --- | --- | | Entities: | **1 Joint(s)** | | Type: | **Fixed Geometry** | | | **Reference Geometry-1** |  | |  |  | | --- | --- | | Entities: | **3 Joint(s)** | | Reference: | **Front Plane** | | Type: | **Use reference geometry** | | Translation: | **---, ---, 0** | | Rotation: | **0, 0, ---** | | Units: | **mm, rad** | |  | ****Load name**** | ****Load Image**** | ****Load Details**** | | --- | --- | --- | | **Force-1** |  | |  |  | | --- | --- | | Entities: | **1 plane(s), 1 Joint(s)** | | Reference: | **Front Plane** | | Type: | **Apply force** | | Values: | **---, -90, --- lbf** | | Moments: | **---, ---, --- lbf.in** | | | **Force-2** |  | |  |  | | --- | --- | | Entities: | **1 plane(s), 1 Beam (s)** | | Reference: | **Front Plane** | | Type: | **Apply force** | | Values: | **---, -1.66667, --- lbf/in** | | Moments: | **---, ---, --- lbf·in/in** | | |

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| Connector Definitions No Data |

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

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| Mesh information  |  |  | | --- | --- | | Mesh type | Beam Mesh |  Mesh information - Details  |  |  | | --- | --- | | Total Nodes | 30 | | Total Elements | 26 | | 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 | 0 | 170 | 0 | 170 |  Reaction Moments  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | lbf.in | 0 | 0 | 10,920 | 10,920 | |
| 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-1(Boss-Extrude2) | 1 | 0 | 0 | 80 | 4,800 | 0 | 0 | | 2 | 0 | 0 | -80 | -1,920 | 0 | 0 | | Beam-3(Boss-Extrude1) | 1 | 0 | 0 | 170 | 10,920 | 0 | 0 | | 2 | 0 | 0 | -170 | -4,800 | 0 | 0 | | Beam-4(Boss-Extrude3) | 1 | 0 | 0 | 1.21389e-07 | -1.16746e-07 | 0 | 0 | | 2 | 0 | 0 | 80 | 1,920 | 0 | 0 |  Beam Stresses  | Beam Name | Joints | Axial(psi) | Bending Dir1(psi) | Bending Dir2(psi) | Torsional (psi) | Upper bound axial and bending(psi) | | --- | --- | --- | --- | --- | --- | --- | | Beam-1(Boss-Extrude2) | 1 | 0 | 3,129.11 | 0 | 0 | 3,129.11 | | 2 | 0 | 1,251.65 | 0 | 0 | 1,251.65 | | Beam-3(Boss-Extrude1) | 1 | 0 | 7,118.73 | 0 | 0 | 7,118.73 | | 2 | 0 | 3,129.11 | 0 | 0 | 3,129.11 | | Beam-4(Boss-Extrude3) | 1 | 0 | 7.61064e-08 | 0 | 0 | 7.61064e-08 | | 2 | 0 | 1,251.65 | 0 | 0 | 1,251.65 | |

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| Study Results  | Name | Type | Min | Max | | --- | --- | --- | --- | | Stress1 | Upper bound axial and bending | 12.516psi  Element: 17 | 7,118.733psi  Element: 16 | | **TU23FL-CAD-HW4.1-Jakob Werle-Stress-Stress1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Displacement1 | URES: Resultant Displacement | 0.000in  Node: 17 | 0.667in  Node: 18 | | **TU23FL-CAD-HW4.1-Jakob Werle-Displacement-Displacement1** | | | |  | Name | Type | | --- | --- | | Shear-Moment Plot1 | Shear Force in Dir2 | | **TU23FL-CAD-HW4.1-Jakob Werle-Shear-Moment Plot-Shear-Moment Plot1** | |  | Name | Type | | --- | --- | | Shear-Moment Plot2 | Moment about Dir1 | | **TU23FL-CAD-HW4.1-Jakob Werle-Shear-Moment Plot-Shear-Moment Plot2** | | |

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| Conclusion |

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| TU23FL-CAD-HW4.1 | |
| Stress\_max [psi] | 7118.7 |
| F\_Ay [lbf] | 170 |
| M\_A [lbf\*in] | 10920 |

A math equations and formulas

Description automatically generated with medium confidence