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|  | |  | | --- | | **Simulation of EDR Chassis Assembly**  **Date: Wednesday, April 2, 2025 Designer: Omni-Directional Robot**  **Study name: Chassis Weight Test**  **Analysis type: Static** | | Table of Contents  [Description 1](#_Toc194445272)  [Assumptions 2](#_Toc194445273)  [Model Information 3](#_Toc194445274)  [Study Properties 10](#_Toc194445275)  [Units 11](#_Toc194445276)  [Material Properties 12](#_Toc194445277)  [Loads and Fixtures 14](#_Toc194445278)  [Connector Definitions 14](#_Toc194445279)  [Interaction Information 15](#_Toc194445280)  [Mesh information 16](#_Toc194445281)  [Sensor Details 17](#_Toc194445282)  [Resultant Forces 17](#_Toc194445283)  [Beams 18](#_Toc194445284)  [Study Results 22](#_Toc194445285)  [Conclusion 24](#_Toc194445286) | |
| Description No Data |

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| Assumptions |

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| Model Information  |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  | | --- | |  |   ****Model name:** EDR Chassis Assembly**  ****Current Configuration:** Default** | | | | | ****Solid Bodies**** | | | | | ****Document Name and Reference**** | ****Treated As**** | ****Volumetric Properties**** | ****Document Path/Date Modified**** | | **Boss-Extrude1** | **Solid Body** | ****Mass:2.55242 kg****  ****Volume:0.000324818 m^3****  ****Density:7,858 kg/m^3****  ****Weight:25.0137 N**** | ****C:\Users\USER\Desktop\Chassis Design\Bottom Plate.SLDPRT****  **Apr 1 23:50:49 2025** | | **Boss-Extrude1** | **Solid Body** | ****Mass:3.0303 kg****  ****Volume:0.000385632 m^3****  ****Density:7,858 kg/m^3****  ****Weight:29.6969 N**** | ****C:\Users\USER\Desktop\Chassis Design\Top Plate.SLDPRT****  **Apr 1 23:50:49 2025** | | ****Beam Bodies:**** | | | | | ****Document Name and Reference**** | ****Formulation**** | ****Properties**** | ****Document Path/Date Modified**** | | **SolidBody 1(Trim/Extend14[2])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.000133699m^2****  ****Length:400mm****  ****Volume:5.34806e-05m^3****  ****Mass Density:7,858kg/m^3****  ****Mass:0.420251kg****  ****Weight:4.11846N**** | ****C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT****  **Apr 1 23:41:29 2025** | | **SolidBody 2(Trim/Extend19[2])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.000133699m^2****  ****Length:60.0036mm****  ****Volume:8.02257e-06m^3****  ****Mass Density:7,858kg/m^3****  ****Mass:0.0630413kg****  ****Weight:0.617805N**** | ****C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT****  **Apr 1 23:41:29 2025** | | **SolidBody 3(Trim/Extend5[1])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.000133699m^2****  ****Length:55mm****  ****Volume:7.35358e-06m^3****  ****Mass Density:7,858kg/m^3****  ****Mass:0.0577845kg****  ****Weight:0.566288N**** | ****C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT****  **Apr 1 23:41:29 2025** | | **SolidBody 4(Trim/Extend22[1])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.000133699m^2****  ****Length:95mm****  ****Volume:1.27016e-05m^3****  ****Mass Density:7,858kg/m^3****  ****Mass:0.0998095kg****  ****Weight:0.978133N**** | ****C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT****  **Apr 1 23:41:29 2025** | | **SolidBody 5(Trim/Extend20[2])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.000133699m^2****  ****Length:55mm****  ****Volume:7.35358e-06m^3****  ****Mass Density:7,858kg/m^3****  ****Mass:0.0577845kg****  ****Weight:0.566288N**** | ****C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT****  **Apr 1 23:41:29 2025** | | **SolidBody 6(Square tube - configured 20 X 20 X 2(1)[24])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.000133699m^2****  ****Length:110mm****  ****Volume:1.47069e-05m^3****  ****Mass Density:7,858kg/m^3****  ****Mass:0.115567kg****  ****Weight:1.13256N**** | ****C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT****  **Apr 1 23:41:29 2025** | | **SolidBody 7(Trim/Extend23[2])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.000133699m^2****  ****Length:55mm****  ****Volume:7.35358e-06m^3****  ****Mass Density:7,858kg/m^3****  ****Mass:0.0577845kg****  ****Weight:0.566288N**** | ****C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT****  **Apr 1 23:41:29 2025** | | **SolidBody 8(Trim/Extend14[1])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.000133699m^2****  ****Length:300mm****  ****Volume:4.01105e-05m^3****  ****Mass Density:7,858kg/m^3****  ****Mass:0.315188kg****  ****Weight:3.08884N**** | ****C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT****  **Apr 1 23:41:29 2025** | | **SolidBody 9(Trim/Extend8[1])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.000133699m^2****  ****Length:95mm****  ****Volume:1.27016e-05m^3****  ****Mass Density:7,858kg/m^3****  ****Mass:0.0998095kg****  ****Weight:0.978133N**** | ****C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT****  **Apr 1 23:41:29 2025** | | **SolidBody 10(Trim/Extend20[1])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.000133699m^2****  ****Length:110mm****  ****Volume:1.47072e-05m^3****  ****Mass Density:7,858kg/m^3****  ****Mass:0.115569kg****  ****Weight:1.13258N**** | ****C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT****  **Apr 1 23:41:29 2025** | | **SolidBody 11(Square tube - configured 20 X 20 X 2(1)[26])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.000133699m^2****  ****Length:110mm****  ****Volume:1.47069e-05m^3****  ****Mass Density:7,858kg/m^3****  ****Mass:0.115567kg****  ****Weight:1.13256N**** | ****C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT****  **Apr 1 23:41:29 2025** | | **SolidBody 12(Trim/Extend18[1])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.000133699m^2****  ****Length:55mm****  ****Volume:7.35358e-06m^3****  ****Mass Density:7,858kg/m^3****  ****Mass:0.0577845kg****  ****Weight:0.566288N**** | ****C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT****  **Apr 1 23:41:29 2025** | | **SolidBody 13(Trim/Extend16[2])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.000133699m^2****  ****Length:400mm****  ****Volume:5.34806e-05m^3****  ****Mass Density:7,858kg/m^3****  ****Mass:0.420251kg****  ****Weight:4.11846N**** | ****C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT****  **Apr 1 23:41:29 2025** | | **SolidBody 14(Trim/Extend10[1])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.000133699m^2****  ****Length:95mm****  ****Volume:1.27016e-05m^3****  ****Mass Density:7,858kg/m^3****  ****Mass:0.0998095kg****  ****Weight:0.978133N**** | ****C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT****  **Apr 1 23:41:29 2025** | | **SolidBody 15(Trim/Extend21[2])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.000133699m^2****  ****Length:300mm****  ****Volume:4.01105e-05m^3****  ****Mass Density:7,858kg/m^3****  ****Mass:0.315188kg****  ****Weight:3.08884N**** | ****C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT****  **Apr 1 23:41:29 2025** | | **SolidBody 16(Square tube - configured 20 X 20 X 2(1)[25])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.000133699m^2****  ****Length:110mm****  ****Volume:1.47069e-05m^3****  ****Mass Density:7,858kg/m^3****  ****Mass:0.115567kg****  ****Weight:1.13256N**** | ****C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT****  **Apr 1 23:41:29 2025** | | **SolidBody 17(Trim/Extend3[2])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.000133699m^2****  ****Length:110mm****  ****Volume:1.47072e-05m^3****  ****Mass Density:7,858kg/m^3****  ****Mass:0.115569kg****  ****Weight:1.13258N**** | ****C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT****  **Apr 1 23:41:29 2025** | | **SolidBody 18(Trim/Extend16[1])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.000133699m^2****  ****Length:300mm****  ****Volume:4.01105e-05m^3****  ****Mass Density:7,858kg/m^3****  ****Mass:0.315188kg****  ****Weight:3.08884N**** | ****C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT****  **Apr 1 23:41:29 2025** | | **SolidBody 19(Trim/Extend7[1])** | **Beam – Uniform C/S** | **Section Standard-weldment profiles/iso/square tube**  **Section Area: 0.000133699m^2**  **Length:50mm**  **Volume:6.68508e-06m^3**  **Mass Density:7,858kg/m^3**  **Mass:0.0525313kg**  **Weight:0.514807N** | **C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT**  **Apr 1 23:41:29 2025** | | **SolidBody 20(Trim/Extend21[1])** | **Beam – Uniform C/S** | **Section Standard-weldment profiles/iso/square tube**  **Section Area: 0.000133699m^2**  **Length:50mm**  **Volume:6.68508e-06m^3**  **Mass Density:7,858kg/m^3**  **Mass:0.0525313kg**  **Weight:0.514807N** | **C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT**  **Apr 1 23:41:29 2025** | | **SolidBody 21(Trim/Extend24[2])** | **Beam – Uniform C/S** | **Section Standard-weldment profiles/iso/square tube**  **Section Area: 0.000133699m^2**  **Length:50mm**  **Volume:6.68508e-06m^3**  **Mass Density:7,858kg/m^3**  **Mass:0.0525313kg**  **Weight:0.514807N** | **C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT**  **Apr 1 23:41:29 2025** | | **SolidBody 22(Trim/Extend4[1])** | **Beam – Uniform C/S** | **Section Standard-weldment profiles/iso/square tube**  **Section Area: 0.000133699m^2**  **Length:52.2184mm**  **Volume:6.98168e-06m^3**  **Mass Density:7,858kg/m^3**  **Mass:0.054862kg**  **Weight:0.537648N** | **C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT**  **Apr 1 23:41:29 2025** | | **SolidBody 23(Trim/Extend2[2])** | **Beam – Uniform C/S** | **Section Standard-weldment profiles/iso/square tube**  **Section Area: 0.000133699m^2**  **Length:50mm**  **Volume:6.68508e-06m^3**  **Mass Density:7,858kg/m^3**  **Mass:0.0525313kg**  **Weight:0.514807N** | **C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT**  **Apr 1 23:41:29 2025** | | **SolidBody 24(Trim/Extend11[2])** | **Beam – Uniform C/S** | **Section Standard-weldment profiles/iso/square tube**  **Section Area: 0.000133699m^2**  **Length:60.0036mm**  **Volume:8.02257e-06m^3**  **Mass Density:7,858kg/m^3**  **Mass:0.0630413kg**  **Weight:0.617805N** | **C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT**  **Apr 1 23:41:29 2025** | | **SolidBody 25(Trim/Extend22[2])** | **Beam – Uniform C/S** | **Section Standard-weldment profiles/iso/square tube**  **Section Area: 0.000133699m^2**  **Length:57.7816mm**  **Volume:7.72549e-06m^3**  **Mass Density:7,858kg/m^3**  **Mass:0.0607069kg**  **Weight:0.594927N** | **C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT**  **Apr 1 23:41:29 2025** | | **SolidBody 26(Trim/Extend24[1])** | **Beam – Uniform C/S** | **Section Standard-weldment profiles/iso/square tube**  **Section Area: 0.000133699m^2**  **Length:300mm**  **Volume:4.01105e-05m^3**  **Mass Density:7,858kg/m^3**  **Mass:0.315188kg**  **Weight:3.08884N** | **C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT**  **Apr 1 23:41:29 2025** | | **SolidBody 27(Trim/Extend5[2])** | **Beam – Uniform C/S** | **Section Standard-weldment profiles/iso/square tube**  **Section Area: 0.000133699m^2**  **Length:95mm**  **Volume:1.27016e-05m^3**  **Mass Density:7,858kg/m^3**  **Mass:0.0998095kg**  **Weight:0.978133N** | **C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT**  **Apr 1 23:41:29 2025** | | **SolidBody 28(Square tube - configured 20 X 20 X 2(1)[27])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.000133699m^2****  ****Length:110mm****  ****Volume:1.47069e-05m^3****  ****Mass Density:7,858kg/m^3****  ****Mass:0.115567kg****  ****Weight:1.13256N**** | ****C:\Users\USER\Desktop\Chassis Design\Box bar frame.SLDPRT****  **Apr 1 23:41:29 2025** | |

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| Study Properties  |  |  | | --- | --- | | Study name | Chassis Weight Test | | 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 | Direct sparse solver | | 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\USER\Desktop\Chassis Design) | |

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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:**** | **1023 Carbon Steel Sheet (SS)** | | ****Model type:**** | **Linear Elastic Isotropic** | | ****Default failure criterion:**** | **Max von Mises Stress** | | ****Yield strength:**** | **2.82685e+08 N/m^2** | | ****Tensile strength:**** | **4.25e+08 N/m^2** | | ****Elastic modulus:**** | **2.05e+11 N/m^2** | | ****Poisson's ratio:**** | **0.29** | | ****Mass density:**** | **7,858 kg/m^3** | | ****Shear modulus:**** | **8e+10 N/m^2** | | ****Thermal expansion coefficient:**** | **1.2e-05 /Kelvin** | | **SolidBody 1(Boss-Extrude1)(Bottom Plate-1),**  **SolidBody 1(Trim/Extend14[2])(Box bar frame-1),**  **SolidBody 2(Trim/Extend19[2])(Box bar frame-1),**  **SolidBody 3(Trim/Extend5[1])(Box bar frame-1),**  **SolidBody 4(Trim/Extend22[1])(Box bar frame-1),**  **SolidBody 5(Trim/Extend20[2])(Box bar frame-1),**  **SolidBody 6(Square tube - configured 20 X 20 X 2(1)[24])(Box bar frame-1),**  **SolidBody 7(Trim/Extend23[2])(Box bar frame-1),**  **SolidBody 8(Trim/Extend14[1])(Box bar frame-1),**  **SolidBody 9(Trim/Extend8[1])(Box bar frame-1),**  **SolidBody 10(Trim/Extend20[1])(Box bar frame-1),**  **SolidBody 11(Square tube - configured 20 X 20 X 2(1)[26])(Box bar frame-1),**  **SolidBody 12(Trim/Extend18[1])(Box bar frame-1),**  **SolidBody 13(Trim/Extend16[2])(Box bar frame-1),**  **SolidBody 14(Trim/Extend10[1])(Box bar frame-1),**  **SolidBody 15(Trim/Extend21[2])(Box bar frame-1),**  **SolidBody 16(Square tube - configured 20 X 20 X 2(1)[25])(Box bar frame-1),**  **SolidBody 17(Trim/Extend3[2])(Box bar frame-1),**  **SolidBody 18(Trim/Extend16[1])(Box bar frame-1),**  **SolidBody 19(Trim/Extend7[1])(Box bar frame-1),**  **SolidBody 20(Trim/Extend21[1])(Box bar frame-1),**  **SolidBody 21(Trim/Extend24[2])(Box bar frame-1),**  **SolidBody 22(Trim/Extend4[1])(Box bar frame-1),**  **SolidBody 23(Trim/Extend2[2])(Box bar frame-1),**  **SolidBody 24(Trim/Extend11[2])(Box bar frame-1),**  **SolidBody 25(Trim/Extend22[2])(Box bar frame-1),**  **SolidBody 26(Trim/Extend24[1])(Box bar frame-1),**  **SolidBody 27(Trim/Extend5[2])(Box bar frame-1),**  **SolidBody 28(Square tube - configured 20 X 20 X 2(1)[27])(Box bar frame-1),**  **SolidBody 1(Boss-Extrude1)(Top Plate-1)** | | **Curve Data:N/A** | | | |

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| **Loads and Fixtures**  | ****Fixture name**** | ****Fixture Image**** | ****Fixture Details**** | | --- | --- | --- | | **Fixed-1** |  | |  |  | | --- | --- | | Type: | **Fixed Geometry** | |  | ****Load name**** | ****Load Image**** | ****Load Details**** | | --- | --- | --- | | **Force-1** |  | |  |  | | --- | --- | | Entities: | **1 face(s)** | | Type: | **Apply normal force** | | Value: | **98.1 N** | | |

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| Connector Definitions No Data |

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| Interaction Information  | Interaction | Interaction Image | Interaction Properties | | --- | --- | --- | | Component Contact-2 |  | |  |  | | --- | --- | | Type: | **Bonded** | | Components: | **3 component(s)** | | Options: | **Continuous 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 for High quality mesh | 16 Points | | Jacobian check for shell | On | | Element Size | 8.69331 mm | | Tolerance | 0.434666 mm | | Mesh Quality | High | | Remesh failed parts independently | Off |  Mesh information - Details  |  |  | | --- | --- | | Total Nodes | 41488 | | Total Elements | 20734 | | Time to complete mesh(hh;mm;ss): | 00:00:07 | | Computer name: |  | |  | | |

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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 | -9.53674e-07 | 0 | 98.1 | 98.1 |  Reaction Moments  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N.m | -0.158036 | 0.00327212 | 0.00951537 | 0.158356 | |
| Free body forces  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N | 4.34408e-05 | 6.35556e-06 | 0.00370944 | 0.0037097 |  Free body moments  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N.m | 0 | 0 | 0 | 1e-33 | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| BeamsBeam Forces  | Beam Name | Joints | Axial(N) | Shear1(N) | Shear2(N) | Moment1(N.m) | Moment2(N.m) | Torque(N.m) | | --- | --- | --- | --- | --- | --- | --- | --- | | Beam-1(Trim/Extend14[2]) | 1 | -1.84929 | 10.1222 | 14.2267 | 0.478417 | -0.277077 | 0.385963 | | 2 | 1.42657 | 10.258 | 14.3817 | -0.472211 | 0.278891 | 0.373873 | | Beam-2(Trim/Extend19[2]) | 1 | -4.15636 | 7.91991 | 24.5527 | -1.24867 | 0.287536 | -0.535613 | | 2 | 4.15634 | -7.91992 | -24.5527 | -0.224579 | 0.187687 | 0.535614 | | Beam-3(Trim/Extend5[1]) | 1 | -4.3206 | -8.77183 | -24.4864 | 0.201346 | -0.193106 | 0.560348 | | 2 | 4.32061 | 8.77183 | 24.4864 | 1.14541 | -0.289344 | -0.560347 | | Beam-4(Trim/Extend22[1]) | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | 2 | 0 | 0 | 0 | 0 | 0 | 0 | | Beam-5(Trim/Extend20[2]) | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | 2 | 0 | 0 | 0 | 0 | 0 | 0 | | Beam-6(Square tube - configured 20 X 20 X 2(1)[24]) | 1 | -24.4932 | -4.33938 | 1.72135 | 0.812377 | 0.577941 | -0.0149599 | | 2 | 24.4932 | 4.33938 | -1.72139 | -0.588599 | -0.0138222 | 0.0149594 | | Beam-7(Trim/Extend23[2]) | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | 2 | 0 | 0 | 0 | 0 | 0 | 0 | | Beam-8(Trim/Extend14[1]) | 1 | 4.9811 | -6.66492 | 9.41163 | 0.185514 | 0.250007 | -0.250512 | | 2 | -5.24788 | -6.8651 | 9.48519 | -0.186103 | -0.255305 | -0.259368 | | Beam-9(Trim/Extend8[1]) | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | 2 | 0 | 0 | 0 | 0 | 0 | 0 | | Beam-10(Trim/Extend20[1]) | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | 2 | 0 | 0 | 0 | 0 | 0 | 0 | | Beam-11(Square tube - configured 20 X 20 X 2(1)[26]) | 1 | -24.5173 | 4.39459 | -1.46506 | -0.79919 | -0.58404 | -0.0142112 | | 2 | 24.5173 | -4.39459 | 1.46514 | 0.608728 | 0.012744 | 0.0142103 | | Beam-12(Trim/Extend18[1]) | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | 2 | 0 | 0 | 0 | 0 | 0 | 0 | | Beam-13(Trim/Extend16[2]) | 1 | -1.38725 | -10.4253 | 14.416 | 0.475579 | 0.284548 | -0.371876 | | 2 | 1.74903 | -10.2737 | 14.1306 | -0.477107 | -0.282131 | -0.384937 | | Beam-14(Trim/Extend10[1]) | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | 2 | 0 | 0 | 0 | 0 | 0 | 0 | | Beam-15(Trim/Extend21[2]) | 1 | -6.24518 | -1.41177 | 0.229724 | -0.135999 | -0.0103495 | -0.0250711 | | 2 | 6.25357 | -1.07015 | 0.843512 | 0.149318 | -0.000939775 | -0.0250649 | | Beam-16(Square tube - configured 20 X 20 X 2(1)[25]) | 1 | -24.5222 | -4.51047 | -1.86341 | -0.819683 | 0.58631 | 0.016867 | | 2 | 24.5221 | 4.51047 | 1.86349 | 0.577435 | 5.02686e-05 | -0.0168661 | | Beam-17(Trim/Extend3[2]) | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | 2 | 0 | 0 | 0 | 0 | 0 | 0 | | Beam-18(Trim/Extend16[1]) | 1 | 5.20263 | 6.77137 | 9.21015 | 0.190038 | -0.25309 | 0.248757 | | 2 | -5.77782 | 6.93871 | 9.66934 | -0.192638 | 0.257112 | 0.257203 | | Beam-19(Trim/Extend7[1]) | 1 | 8.77183 | -4.3206 | 24.4864 | 0.560348 | 0.193106 | -0.201346 | | 2 | -8.77183 | 4.3206 | -24.4864 | 0.66397 | 0.0229238 | 0.201346 | | Beam-20(Trim/Extend21[1]) | 1 | 8.10866 | -4.4337 | -24.6019 | -0.686886 | 0.0251607 | -0.227599 | | 2 | -8.10866 | 4.4337 | 24.6019 | -0.543208 | 0.196524 | 0.227599 | | Beam-21(Trim/Extend24[2]) | 1 | 7.91991 | 4.15635 | 24.5527 | 0.535614 | -0.187687 | 0.224579 | | 2 | -7.91991 | -4.15635 | -24.5527 | 0.692022 | -0.0201308 | -0.224579 | | Beam-22(Trim/Extend4[1]) | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | 2 | 0 | 0 | 0 | 0 | 0 | 0 | | Beam-23(Trim/Extend2[2]) | 1 | 8.58309 | 4.26944 | -24.459 | -0.673469 | -0.0188751 | 0.219448 | | 2 | -8.58309 | -4.26944 | 24.459 | -0.549482 | -0.194597 | -0.219448 | | Beam-24(Trim/Extend11[2]) | 1 | -4.4337 | -8.10865 | 24.6019 | -1.2486 | -0.290024 | 0.543208 | | 2 | 4.43369 | 8.10866 | -24.6019 | -0.2276 | -0.196524 | -0.543208 | | Beam-25(Trim/Extend22[2]) | 1 | 4.26945 | -8.58309 | 24.459 | 1.19383 | 0.301348 | 0.549481 | | 2 | -4.26944 | 8.58309 | -24.459 | 0.219448 | 0.194597 | -0.549482 | | Beam-26(Trim/Extend24[1]) | 1 | 6.33621 | 1.26465 | 0.25256 | 0.14274 | -0.007208 | 0.0260117 | | 2 | -6.21188 | 1.25204 | 0.478026 | -0.135821 | 0.0024686 | 0.0222519 | | Beam-27(Trim/Extend5[2]) | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | 2 | 0 | 0 | 0 | 0 | 0 | 0 | | Beam-28(Square tube - configured 20 X 20 X 2(1)[27]) | 1 | -24.5674 | 4.45523 | 1.60716 | 0.810734 | -0.590589 | 0.0160187 | | 2 | 24.5674 | -4.45523 | -1.6072 | -0.601801 | 0.0114093 | -0.0160182 |  Beam Stresses  | Beam Name | Joints | Axial(N/m^2) | Bending Dir1(N/m^2) | Bending Dir2(N/m^2) | Torsional (N/m^2) | Upper bound axial and bending(N/m^2) | | --- | --- | --- | --- | --- | --- | --- | | Beam-1(Trim/Extend14[2]) | 1 | -13,831.7 | 691,188 | 400,304 | 397,778 | 1.10532e+06 | | 2 | -10,670 | 682,222 | 402,925 | 385,318 | 1.09582e+06 | | Beam-2(Trim/Extend19[2]) | 1 | 31,087.4 | 1.80401e+06 | 415,415 | -552,010 | 2.25051e+06 | | 2 | 31,087.3 | -324,458 | -271,158 | 552,011 | 626,704 | | Beam-3(Trim/Extend5[1]) | 1 | 32,315.8 | -290,893 | -278,988 | 577,502 | 602,197 | | 2 | 32,315.9 | 1.65481e+06 | 418,027 | -577,501 | 2.10515e+06 | | Beam-4(Trim/Extend22[1]) | 1 | 0 | 0 | 0 | 0 | 0 | | 2 | 0 | 0 | 0 | 0 | 0 | | Beam-5(Trim/Extend20[2]) | 1 | 0 | 0 | 0 | 0 | 0 | | 2 | 0 | 0 | 0 | 0 | 0 | | Beam-6(Square tube - configured 20 X 20 X 2(1)[24]) | 1 | -183,197 | 1.17367e+06 | -834,975 | -15,417.8 | 2.19184e+06 | | 2 | -183,197 | 850,372 | -19,969.5 | 15,417.3 | 1.05354e+06 | | Beam-7(Trim/Extend23[2]) | 1 | 0 | 0 | 0 | 0 | 0 | | 2 | 0 | 0 | 0 | 0 | 0 | | Beam-8(Trim/Extend14[1]) | 1 | 37,256.1 | 268,019 | -361,195 | -258,181 | 666,470 | | 2 | 39,251.4 | 268,870 | -368,850 | -267,308 | 676,971 | | Beam-9(Trim/Extend8[1]) | 1 | 0 | 0 | 0 | 0 | 0 | | 2 | 0 | 0 | 0 | 0 | 0 | | Beam-10(Trim/Extend20[1]) | 1 | 0 | 0 | 0 | 0 | 0 | | 2 | 0 | 0 | 0 | 0 | 0 | | Beam-11(Square tube - configured 20 X 20 X 2(1)[26]) | 1 | -183,376 | -1.15462e+06 | 843,786 | -14,646.3 | 2.18178e+06 | | 2 | -183,376 | -879,453 | 18,411.8 | 14,645.3 | 1.08124e+06 | | Beam-12(Trim/Extend18[1]) | 1 | 0 | 0 | 0 | 0 | 0 | | 2 | 0 | 0 | 0 | 0 | 0 | | Beam-13(Trim/Extend16[2]) | 1 | -10,375.9 | 687,087 | -411,098 | -383,260 | 1.10856e+06 | | 2 | -13,081.8 | 689,295 | -407,606 | -396,721 | 1.10998e+06 | | Beam-14(Trim/Extend10[1]) | 1 | 0 | 0 | 0 | 0 | 0 | | 2 | 0 | 0 | 0 | 0 | 0 | | Beam-15(Trim/Extend21[2]) | 1 | 46,710.7 | 196,484 | -14,952.3 | -25,838.6 | 258,147 | | 2 | 46,773.5 | 215,726 | 1,357.73 | -25,832.2 | 263,857 | | Beam-16(Square tube - configured 20 X 20 X 2(1)[25]) | 1 | -183,413 | -1.18423e+06 | -847,066 | 17,383.4 | 2.21471e+06 | | 2 | -183,413 | -834,243 | 72.625 | -17,382.4 | 1.01773e+06 | | Beam-17(Trim/Extend3[2]) | 1 | 0 | 0 | 0 | 0 | 0 | | 2 | 0 | 0 | 0 | 0 | 0 | | Beam-18(Trim/Extend16[1]) | 1 | 38,912.9 | 274,556 | 365,650 | 256,372 | 679,118 | | 2 | 43,215.1 | 278,312 | 371,460 | 265,077 | 692,987 | | Beam-19(Trim/Extend7[1]) | 1 | 65,608.7 | 809,557 | -278,988 | -207,510 | 1.15415e+06 | | 2 | 65,608.7 | -959,264 | 33,118.9 | 207,510 | 1.05799e+06 | | Beam-20(Trim/Extend21[1]) | 1 | 60,648.5 | -992,371 | -36,350.6 | -234,567 | 1.08937e+06 | | 2 | 60,648.5 | 784,795 | 283,926 | 234,567 | 1.12937e+06 | | Beam-21(Trim/Extend24[2]) | 1 | 59,236.9 | 773,823 | 271,158 | 231,453 | 1.10422e+06 | | 2 | 59,236.9 | -999,791 | -29,083.7 | -231,453 | 1.08811e+06 | | Beam-22(Trim/Extend4[1]) | 1 | 0 | 0 | 0 | 0 | 0 | | 2 | 0 | 0 | 0 | 0 | 0 | | Beam-23(Trim/Extend2[2]) | 1 | 64,197.1 | -972,987 | 27,269.6 | 226,166 | 1.06445e+06 | | 2 | 64,197.1 | 793,858 | -281,142 | -226,166 | 1.1392e+06 | | Beam-24(Trim/Extend11[2]) | 1 | 33,161.8 | 1.8039e+06 | -419,009 | 559,837 | 2.25608e+06 | | 2 | 33,161.7 | -328,822 | 283,926 | -559,837 | 645,910 | | Beam-25(Trim/Extend22[2]) | 1 | 31,933.2 | 1.72478e+06 | -435,369 | 566,302 | 2.19208e+06 | | 2 | 31,933.2 | -317,046 | 281,142 | -566,303 | 630,121 | | Beam-26(Trim/Extend24[1]) | 1 | 47,391.6 | 206,221 | 10,413.7 | 26,808 | 264,027 | | 2 | 46,461.7 | 196,226 | 3,566.48 | 22,933.1 | 246,254 | | Beam-27(Trim/Extend5[2]) | 1 | 0 | 0 | 0 | 0 | 0 | | 2 | 0 | 0 | 0 | 0 | 0 | | Beam-28(Square tube - configured 20 X 20 X 2(1)[27]) | 1 | -183,751 | 1.1713e+06 | 853,247 | 16,509.1 | 2.2083e+06 | | 2 | -183,751 | 869,445 | 16,483.5 | -16,508.6 | 1.06968e+06 | |

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| Study Results  | Name | Type | Min | Max | | --- | --- | --- | --- | | Stress1 | SX: X Normal Stress | -1.571e+06N/m^2  Element: 10696 | 1.499e+06N/m^2  Element: 17976 | | **EDR Chassis Assembly-Chassis Weight Test-Stress-Stress1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Displacement1 | URES: Resultant Displacement | 0.000e+00mm  Node: 41290 | 3.747e-02mm  Node: 39397 | | **EDR Chassis Assembly-Chassis Weight Test-Displacement-Displacement1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Strain1 | ESTRN: Equivalent Strain | 0.000e+00  Element: 20539 | 7.174e-06  Element: 16349 | | **EDR Chassis Assembly-Chassis Weight Test-Strain-Strain1** | | | |  |  | | --- | |  | | **Image-1** |  |  | | --- | |  | | **Image-2** |  |  | | --- | |  | | **Image-3** |  |  | | --- | |  | | **Image-4** |  |  | | --- | |  | | **Image-5** |  |  | | --- | |  | | **Image-6** |  |  | | --- | |  | | **Image-7** |  |  | | --- | |  | | **Image-8** |  |  | | --- | |  | | **Image-9** |  |  | | --- | |  | | **Image-10** | |

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| Conclusion |