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|  | |  | | --- | | **Simulation of Support Structure**  **Date: 19 December 2024 Designer: Solidworks**  **Study name: Static 1**  **Analysis type: Static** | | Table of Contents  [Description 1](#_Toc185537830)  [Assumptions 2](#_Toc185537831)  [Model Information 3](#_Toc185537832)  [Study Properties 9](#_Toc185537833)  [Units 9](#_Toc185537834)  [Material Properties 10](#_Toc185537835)  [Loads and Fixtures 12](#_Toc185537836)  [Connector Definitions 12](#_Toc185537837)  [Interaction Information 13](#_Toc185537838)  [Mesh information 13](#_Toc185537839)  [Sensor Details 13](#_Toc185537840)  [Resultant Forces 14](#_Toc185537841)  [Beams 15](#_Toc185537842)  [Study Results 18](#_Toc185537843)  [Conclusion 21](#_Toc185537844) | |
| Description No Data |

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| Assumptions |

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| Model Information  |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  | | --- | |  |   ****Model name:** Support Structure**  ****Current Configuration:** Default<As Machined>** | | | | | ****Solid Bodies**** | | | | | ****Document Name and Reference**** | ****Treated As**** | ****Volumetric Properties**** | ****Document Path/Date Modified**** | | **Mirror5[3]** | **Solid Body** | ****Mass:2.8457 kg****  ****Volume:0.000389821 m^3****  ****Density:7,300 kg/m^3****  ****Weight:27.8878 N**** | ****E:\4-Skill Sets!\A-SolidWorks\Support Structure.SLDPRT****  **Dec 18 23:23:32 2024** | | **Boss-Extrude1** | **Solid Body** | ****Mass:2.8457 kg****  ****Volume:0.000389821 m^3****  ****Density:7,300 kg/m^3****  ****Weight:27.8878 N**** | ****E:\4-Skill Sets!\A-SolidWorks\Support Structure.SLDPRT****  **Dec 18 23:23:32 2024** | | **Mirror5[2]** | **Solid Body** | ****Mass:2.8457 kg****  ****Volume:0.000389821 m^3****  ****Density:7,300 kg/m^3****  ****Weight:27.8878 N**** | ****E:\4-Skill Sets!\A-SolidWorks\Support Structure.SLDPRT****  **Dec 18 23:23:32 2024** | | **Mirror5[1]** | **Solid Body** | ****Mass:2.8457 kg****  ****Volume:0.000389821 m^3****  ****Density:7,300 kg/m^3****  ****Weight:27.8878 N**** | ****E:\4-Skill Sets!\A-SolidWorks\Support Structure.SLDPRT****  **Dec 18 23:23:32 2024** | | **Mirror4[2]** | **Solid Body** | ****Mass:2.8457 kg****  ****Volume:0.000389821 m^3****  ****Density:7,300 kg/m^3****  ****Weight:27.8878 N**** | ****E:\4-Skill Sets!\A-SolidWorks\Support Structure.SLDPRT****  **Dec 18 23:23:32 2024** | | **Mirror4[1]** | **Solid Body** | ****Mass:2.8457 kg****  ****Volume:0.000389821 m^3****  ****Density:7,300 kg/m^3****  ****Weight:27.8878 N**** | ****E:\4-Skill Sets!\A-SolidWorks\Support Structure.SLDPRT****  **Dec 18 23:23:32 2024** | | **Mirror5[4]** | **Solid Body** | ****Mass:2.8457 kg****  ****Volume:0.000389821 m^3****  ****Density:7,300 kg/m^3****  ****Weight:27.8878 N**** | ****E:\4-Skill Sets!\A-SolidWorks\Support Structure.SLDPRT****  **Dec 18 23:23:32 2024** | | **Mirror3** | **Solid Body** | ****Mass:2.8457 kg****  ****Volume:0.000389821 m^3****  ****Density:7,300 kg/m^3****  ****Weight:27.8878 N**** | ****E:\4-Skill Sets!\A-SolidWorks\Support Structure.SLDPRT****  **Dec 18 23:23:32 2024** | | ****Beam Bodies:**** | | | | | ****Document Name and Reference**** | ****Formulation**** | ****Properties**** | ****Document Path/Date Modified**** | | **SolidBody 3(Square tube 80 X 80 X 5(21)[6])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.00183562m^2****  ****Length:1,490mm****  ****Volume:0.00273507m^3****  ****Mass Density:7,300kg/m^3****  ****Mass:19.966kg****  ****Weight:195.667N**** | ****E:\4-Skill Sets!\A-SolidWorks\Support Structure.SLDPRT****  **Dec 18 23:23:32 2024** | | **SolidBody 5(Square tube 80 X 80 X 5(21)[11])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.00183562m^2****  ****Length:2,590mm****  ****Volume:0.00475425m^3****  ****Mass Density:7,300kg/m^3****  ****Mass:34.7061kg****  ****Weight:340.119N**** | ****E:\4-Skill Sets!\A-SolidWorks\Support Structure.SLDPRT****  **Dec 18 23:23:32 2024** | | **SolidBody 6(Square tube 80 X 80 X 5(21)[7])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.00183562m^2****  ****Length:1,000mm****  ****Volume:0.00183562m^3****  ****Mass Density:7,300kg/m^3****  ****Mass:13.4kg****  ****Weight:131.32N**** | ****E:\4-Skill Sets!\A-SolidWorks\Support Structure.SLDPRT****  **Dec 18 23:23:32 2024** | | **SolidBody 8(Square tube 80 X 80 X 5(21)[12])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.00183562m^2****  ****Length:2,590mm****  ****Volume:0.00475425m^3****  ****Mass Density:7,300kg/m^3****  ****Mass:34.7061kg****  ****Weight:340.119N**** | ****E:\4-Skill Sets!\A-SolidWorks\Support Structure.SLDPRT****  **Dec 18 23:23:32 2024** | | **SolidBody 9(Trim/Extend4[2])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.00183562m^2****  ****Length:1,590mm****  ****Volume:0.00291868m^3****  ****Mass Density:7,300kg/m^3****  ****Mass:21.3063kg****  ****Weight:208.802N**** | ****E:\4-Skill Sets!\A-SolidWorks\Support Structure.SLDPRT****  **Dec 18 23:23:32 2024** | | **SolidBody 10(Square tube 80 X 80 X 5(21)[8])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.00183562m^2****  ****Length:1,000mm****  ****Volume:0.00183562m^3****  ****Mass Density:7,300kg/m^3****  ****Mass:13.4kg****  ****Weight:131.32N**** | ****E:\4-Skill Sets!\A-SolidWorks\Support Structure.SLDPRT****  **Dec 18 23:23:32 2024** | | **SolidBody 12(Square tube 80 X 80 X 5(21)[13])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.00183562m^2****  ****Length:2,590mm****  ****Volume:0.00475425m^3****  ****Mass Density:7,300kg/m^3****  ****Mass:34.7061kg****  ****Weight:340.119N**** | ****E:\4-Skill Sets!\A-SolidWorks\Support Structure.SLDPRT****  **Dec 18 23:23:32 2024** | | **SolidBody 13(Trim/Extend2[2])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.00183562m^2****  ****Length:1,590mm****  ****Volume:0.00291868m^3****  ****Mass Density:7,300kg/m^3****  ****Mass:21.3063kg****  ****Weight:208.802N**** | ****E:\4-Skill Sets!\A-SolidWorks\Support Structure.SLDPRT****  **Dec 18 23:23:32 2024** | | **SolidBody 14(Trim/Extend4[1])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.00183562m^2****  ****Length:3,150mm****  ****Volume:0.00578228m^3****  ****Mass Density:7,300kg/m^3****  ****Mass:42.2107kg****  ****Weight:413.664N**** | ****E:\4-Skill Sets!\A-SolidWorks\Support Structure.SLDPRT****  **Dec 18 23:23:32 2024** | | **SolidBody 15(Square tube 80 X 80 X 5(21)[9])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.00183562m^2****  ****Length:520mm****  ****Volume:0.000954522m^3****  ****Mass Density:7,300kg/m^3****  ****Mass:6.96801kg****  ****Weight:68.2865N**** | ****E:\4-Skill Sets!\A-SolidWorks\Support Structure.SLDPRT****  **Dec 18 23:23:32 2024** | | **SolidBody 17(Square tube 80 X 80 X 5(21)[14])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.00183562m^2****  ****Length:2,590mm****  ****Volume:0.00475425m^3****  ****Mass Density:7,300kg/m^3****  ****Mass:34.7061kg****  ****Weight:340.119N**** | ****E:\4-Skill Sets!\A-SolidWorks\Support Structure.SLDPRT****  **Dec 18 23:23:32 2024** | | **SolidBody 18(Trim/Extend3[2])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.00183562m^2****  ****Length:3,150mm****  ****Volume:0.00578228m^3****  ****Mass Density:7,300kg/m^3****  ****Mass:42.2107kg****  ****Weight:413.664N**** | ****E:\4-Skill Sets!\A-SolidWorks\Support Structure.SLDPRT****  **Dec 18 23:23:32 2024** | | **SolidBody 21(Square tube 80 X 80 X 5(21)[10])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.00183562m^2****  ****Length:520mm****  ****Volume:0.000954522m^3****  ****Mass Density:7,300kg/m^3****  ****Mass:6.96801kg****  ****Weight:68.2865N**** | ****E:\4-Skill Sets!\A-SolidWorks\Support Structure.SLDPRT****  **Dec 18 23:23:32 2024** | | **SolidBody 22(Square tube 80 X 80 X 5(21)[5])** | **Beam – Uniform C/S** | ****Section Standard-weldment profiles/iso/square tube****  ****Section Area: 0.00183562m^2****  ****Length:1,490mm****  ****Volume:0.00273507m^3****  ****Mass Density:7,300kg/m^3****  ****Mass:19.966kg****  ****Weight:195.667N**** | 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| Study Properties  |  |  | | --- | --- | | Study name | Static 1 | | 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 | Automatic | | Inplane Effect: | Off | | Soft Spring: | On | | 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 (E:\4-Skill Sets!\A-SolidWorks) | |

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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:**** | **Malleable Cast Iron** | | ****Model type:**** | **Linear Elastic Isotropic** | | ****Default failure criterion:**** | **Max von Mises Stress** | | ****Yield strength:**** | **2.75742e+08 N/m^2** | | ****Tensile strength:**** | **4.13613e+08 N/m^2** | | ****Elastic modulus:**** | **1.9e+11 N/m^2** | | ****Poisson's ratio:**** | **0.27** | | ****Mass density:**** | **7,300 kg/m^3** | | ****Shear modulus:**** | **8.6e+10 N/m^2** | | ****Thermal expansion coefficient:**** | **1.2e-05 /Kelvin** | | **SolidBody 1(Mirror5[3])(Support Structure),**  **SolidBody 2(Boss-Extrude1)(Support Structure),**  **SolidBody 3(Square tube 80 X 80 X 5(21)[6])(Support Structure),**  **SolidBody 4(Mirror5[2])(Support Structure),**  **SolidBody 5(Square tube 80 X 80 X 5(21)[11])(Support Structure),**  **SolidBody 6(Square tube 80 X 80 X 5(21)[7])(Support Structure),**  **SolidBody 7(Mirror5[1])(Support Structure),**  **SolidBody 8(Square tube 80 X 80 X 5(21)[12])(Support Structure),**  **SolidBody 9(Trim/Extend4[2])(Support Structure),**  **SolidBody 10(Square tube 80 X 80 X 5(21)[8])(Support Structure),**  **SolidBody 11(Mirror4[2])(Support Structure),**  **SolidBody 12(Square tube 80 X 80 X 5(21)[13])(Support Structure),**  **SolidBody 13(Trim/Extend2[2])(Support Structure),**  **SolidBody 14(Trim/Extend4[1])(Support Structure),**  **SolidBody 15(Square tube 80 X 80 X 5(21)[9])(Support Structure),**  **SolidBody 16(Mirror4[1])(Support Structure),**  **SolidBody 17(Square tube 80 X 80 X 5(21)[14])(Support Structure),**  **SolidBody 18(Trim/Extend3[2])(Support Structure),**  **SolidBody 19(Mirror5[4])(Support Structure),**  **SolidBody 20(Mirror3)(Support Structure),**  **SolidBody 21(Square tube 80 X 80 X 5(21)[10])(Support Structure),**  **SolidBody 22(Square tube 80 X 80 X 5(21)[5])(Support Structure)** | | **Curve Data:N/A** | | | |

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| **Loads and Fixtures**  | ****Fixture name**** | ****Fixture Image**** | ****Fixture Details**** | | --- | --- | --- | | **Fixed-1** |  | |  |  | | --- | --- | | Entities: | **4 face(s)** | | Type: | **Fixed Geometry** | | | ****Resultant Forces****   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Components** | **X** | **Y** | **Z** | **Resultant** | | **Reaction force(N)** | **0.000107892** | **599.999** | **-6.92382e-05** | **599.999** | | **Reaction Moment(N.m)** | **0** | **0** | **0** | **1e-33** | | | |  | ****Load name**** | ****Load Image**** | ****Load Details**** | | --- | --- | --- | | **Force-1** |  | |  |  | | --- | --- | | Entities: | **6 Beam (s)** | | Reference: | **Edge< 1 >** | | Type: | **Apply force** | | Values: | **---, ---, -,100 N** | | Moments: | **---, ---, --- N.m** | | |

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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 | Mixed Mesh | | Mesher Used: | Blended curvature-based mesh | | Jacobian points for High quality mesh | 16 Points | | Jacobian check for shell | Off | | Maximum element size | 0 mm | | Minimum element size | 0 mm | | Mesh Quality | High |  Mesh information - Details  |  |  | | --- | --- | | Total Nodes | 36481 | | Total Elements | 18085 | | Time to complete mesh(hh;mm;ss): | 00:00:05 | | Computer name: | NITIN | |

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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 | 0.000107892 | 599.999 | -6.92382e-05 | 599.999 |  Reaction Moments  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N.m | 0 | 0 | 0 | 1e-33 | |
| Free body forces  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N | -1.19135e-05 | -0.000891309 | 8.26642e-05 | 0.000895214 |  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(Square tube 80 X 80 X 5(21)[6]) | 1 | -0.285283 | -77.1673 | 0.047494 | 0.0422646 | 58.8774 | -9.33462 | | 2 | 0.1795 | 43.2706 | 0.232733 | 0.0896615 | 22.3676 | 7.40479 | | 3 | 0.335408 | 115.04 | -0.864124 | -0.131487 | -0.818607 | 22.2315 | | 4 | 0.285283 | 123.079 | -0.047494 | -0.00759401 | 14.2125 | 9.33462 | | Beam-2(Square tube 80 X 80 X 5(21)[11]) | 1 | 360.362 | 5.13908 | 4.00981 | 356.253 | 5.49564 | 3.18478 | | 2 | -360.362 | -5.13908 | -4.00981 | -366.839 | 8.07153 | -3.18478 | | Beam-3(Square tube 80 X 80 X 5(21)[7]) | 1 | 0.185129 | 81.4441 | -0.4649 | -0.0971074 | -16.7394 | -21.7702 | | 2 | 0.867217 | -74.7982 | -0.767248 | -0.00392654 | -19.1506 | 11.1841 | | 3 | 0.53735 | 13.7587 | -0.318481 | -0.0860154 | -5.63773 | -7.22003 | | 4 | -0.866741 | 98.4346 | 0.767248 | -0.195496 | 41.6709 | -11.1841 | | Beam-4(Square tube 80 X 80 X 5(21)[12]) | 1 | 1.93097e-09 | -1.43986e-10 | 2.90668e-09 | 2.2767e-09 | 3.82468e-11 | 2.37059e-11 | | 2 | -3.15173e-07 | 3.34335e-09 | -2.05108e-08 | -1.35835e-07 | -6.32568e-09 | -7.16724e-10 | | Beam-5(Trim/Extend4[2]) | 1 | -5.03936 | 10.9191 | 2.9537 | 2.36071 | -1.05648 | 11.1174 | | 2 | 5.0393 | -10.9191 | -2.9537 | 2.33573 | -16.3049 | -11.1174 | | Beam-6(Square tube 80 X 80 X 5(21)[8]) | 1 | -1.09713 | 56.6754 | -0.156134 | -0.0137391 | -14.8266 | 2.61218 | | 2 | -1.77824 | -139.81 | 0.146214 | -0.00784473 | -18.5405 | -17.8669 | | 3 | -1.44894 | -22.9119 | -0.302612 | -0.0816204 | 3.83729 | -8.24839 | | 4 | 1.77908 | 163.446 | -0.146214 | 0.0457621 | 57.9637 | 17.8669 | | Beam-7(Square tube 80 X 80 X 5(21)[13]) | 1 | 239.638 | -5.13908 | -4.00981 | 357.747 | -3.47138 | 3.19082 | | 2 | -239.638 | 5.13908 | 4.00981 | -347.161 | -10.0958 | -3.19082 | | Beam-8(Trim/Extend2[2]) | 1 | 0.0214631 | -1.58034 | -0.00222192 | -0.00638313 | 8.82353 | 0.217535 | | 2 | -0.0214546 | 1.58034 | 0.00222196 | 0.00285141 | -6.31079 | -0.217535 | | Beam-9(Trim/Extend4[1]) | 1 | 0.00222189 | 1.58034 | 0.0214588 | -0.0219822 | 2.30655 | -8.82353 | | 2 | 1.05702 | 349.443 | 0.0871985 | 0.837698 | 377.956 | -7.01547 | | 3 | 0.00222194 | 1.58034 | 0.0214588 | 0.00638371 | 0.217535 | -8.82353 | | 4 | -1.0552 | -349.443 | -0.109017 | -0.883832 | -154.313 | 7.01479 | | Beam-10(Square tube 80 X 80 X 5(21)[9]) | 1 | -0.448646 | 35.8296 | -0.329414 | 0.102809 | -18.4041 | -6.20203 | | 2 | 0.448569 | 64.1704 | 0.329993 | 0.101641 | 9.61847 | 6.20201 | | Beam-11(Square tube 80 X 80 X 5(21)[14]) | 1 | 1.81622e-09 | -2.01699e-10 | 3.28966e-09 | 2.28137e-09 | 6.11234e-11 | 2.36986e-11 | | 2 | -2.16681e-07 | 4.04729e-09 | -1.52358e-08 | -1.25659e-07 | -8.17809e-09 | -7.21612e-10 | | Beam-12(Trim/Extend3[2]) | 1 | -0.002222 | -1.58034 | -0.0214588 | 0.0255151 | -2.30655 | 6.31079 | | 2 | -1.05546 | 250.557 | -0.0997513 | 0.855045 | 336.044 | 26.4008 | | 3 | -0.00222196 | -1.58034 | -0.0214588 | -0.00285082 | -0.217535 | 6.31079 | | 4 | 1.05676 | -250.557 | 0.0997513 | -0.791342 | -175.687 | -26.4007 | | Beam-13(Square tube 80 X 80 X 5(21)[10]) | 1 | 0.146512 | 44.0491 | -0.351527 | 0.110019 | -14.5501 | -7.00105 | | 2 | -0.146545 | 55.9509 | 0.352684 | 0.108324 | 10.8606 | 7.00101 | | Beam-14(Square tube 80 X 80 X 5(21)[5]) | 1 | -0.60311 | 24.0195 | 0.144023 | 0.0186918 | 43.5835 | 3.77968 | | 2 | -0.456288 | 225.92 | 1.92246 | 0.29526 | 21.9323 | -54.1841 | | 3 | -0.457664 | 235.983 | 1.92246 | 0.60253 | -15.0199 | -54.1841 | | 4 | -0.164073 | 125.898 | -1.01084 | 0.536066 | 18.499 | -45.4505 |  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(Square tube 80 X 80 X 5(21)[6]) | 1 | -155.415 | 779.496 | -1.08589e+06 | -140,834 | 1.08683e+06 | | 2 | 97.7871 | 1,653.65 | -412,531 | 111,718 | 414,282 | | 3 | 182.722 | -2,425.05 | 15,097.8 | 335,411 | 17,705.5 | | 4 | -155.415 | 140.058 | 262,125 | -140,834 | 262,420 | | Beam-2(Square tube 80 X 80 X 5(21)[11]) | 1 | -196,316 | -6.57046e+06 | 101,357 | -48,049.6 | 6.86813e+06 | | 2 | -196,316 | -6.7657e+06 | -148,865 | -48,049.6 | 7.11088e+06 | | Beam-3(Square tube 80 X 80 X 5(21)[7]) | 1 | 100.854 | -1,790.98 | 308,730 | -328,452 | 310,621 | | 2 | 472.438 | -72.4181 | 353,200 | 168,737 | 353,745 | | 3 | 292.735 | -1,586.4 | 103,978 | -108,930 | 105,857 | | 4 | 472.179 | 3,605.59 | 768,546 | 168,737 | 772,624 | | Beam-4(Square tube 80 X 80 X 5(21)[12]) | 1 | -1.05195e-06 | -4.19896e-05 | 7.05394e-07 | -3.57657e-07 | 4.3747e-05 | | 2 | -0.000171699 | -0.00250523 | 0.000116666 | -1.08134e-05 | 0.00279359 | | Beam-5(Trim/Extend4[2]) | 1 | -2,745.32 | 43,539.2 | 19,485 | 167,731 | 65,769.5 | | 2 | -2,745.29 | -43,078.4 | -300,715 | 167,731 | 346,539 | | Beam-6(Square tube 80 X 80 X 5(21)[8]) | 1 | -597.688 | -253.393 | 273,451 | 39,410.5 | 274,302 | | 2 | -968.744 | -144.682 | 341,947 | -269,561 | 343,061 | | 3 | -789.348 | -1,505.34 | -70,772 | -124,445 | 73,066.7 | | 4 | -969.198 | -844 | 1.06904e+06 | -269,561 | 1.07085e+06 | | Beam-7(Square tube 80 X 80 X 5(21)[13]) | 1 | -130,549 | -6.59801e+06 | -64,023.4 | -48,140.6 | 6.79259e+06 | | 2 | -130,549 | -6.40278e+06 | 186,199 | -48,140.6 | 6.71952e+06 | | Beam-8(Trim/Extend2[2]) | 1 | 11.6926 | -117.725 | -162,735 | 3,282.01 | 162,864 | | 2 | 11.6879 | -52.5892 | -116,391 | 3,282 | 116,456 | | Beam-9(Trim/Extend4[1]) | 1 | 1.21043 | -405.422 | -42,540.3 | -133,123 | 42,946.9 | | 2 | -575.839 | -15,449.9 | 6.97074e+06 | 105,844 | 6.98676e+06 | | 3 | 1.21046 | 117.736 | -4,012.06 | -133,123 | 4,131.01 | | 4 | -574.846 | -16,300.7 | 2.84603e+06 | 105,834 | 2.8629e+06 | | Beam-10(Square tube 80 X 80 X 5(21)[9]) | 1 | 244.411 | -1,896.13 | -339,431 | 93,571.4 | 341,572 | | 2 | 244.369 | 1,874.58 | -177,396 | 93,571.1 | 179,515 | | Beam-11(Square tube 80 X 80 X 5(21)[14]) | 1 | -9.8943e-07 | -4.20758e-05 | 1.12731e-06 | -3.57547e-07 | 4.41926e-05 | | 2 | -0.000118043 | -0.00231756 | 0.000150831 | -1.08871e-05 | 0.00258643 | | Beam-12(Trim/Extend3[2]) | 1 | -1.21049 | 470.58 | 42,540.3 | 95,212.3 | 43,012 | | 2 | 574.987 | -15,769.8 | 6.19774e+06 | -398,314 | 6.21408e+06 | | 3 | -1.21047 | -52.5784 | 4,012.05 | 95,212.3 | 4,065.84 | | 4 | 575.699 | -14,594.9 | 3.24024e+06 | -398,314 | 3.25541e+06 | | Beam-13(Square tube 80 X 80 X 5(21)[10]) | 1 | -79.816 | -2,029.1 | -268,352 | 105,626 | 270,460 | | 2 | -79.834 | 1,997.85 | -200,304 | 105,626 | 202,382 | | Beam-14(Square tube 80 X 80 X 5(21)[5]) | 1 | -328.56 | 344.736 | -803,821 | 57,025 | 804,494 | | 2 | -248.574 | 5,445.56 | -404,503 | -817,488 | 410,197 | | 3 | -249.324 | 11,112.6 | 277,016 | -817,488 | 288,378 | | 4 | 89.383 | -9,886.79 | 341,182 | 685,723 | 351,158 | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Study Results  | Name | Type | Min | Max | | --- | --- | --- | --- | | Stress1 | VON: von Mises Stress | 0.000e+00N/m^2  Node: 1 | 3.311e+06N/m^2  Node: 35873 | | **Support Structure-Static 1-Stress-Stress1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Displacement1 | URES: Resultant Displacement | 0.000e+00mm  Node: 1 | 7.827e+00mm  Node: 36235 | | **Support Structure-Static 1-Displacement-Displacement1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Strain1 | ESTRN: Equivalent Strain | 0.000e+00  Element: 1 | 1.327e-05  Element: 11420 | | **Support Structure-Static 1-Strain-Strain1** | | | |  | Name | Type | | --- | --- | | Displacement1{1} | Deformed shape | | **Support Structure-Static 1-Displacement-Displacement1{1}** | | |

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| --- |
| Conclusion |