Analysis1

**MESH:**

|  |  |
| --- | --- |
| **Entity** | **Size** |
| Nodes | 17093 |
| Elements | 57674 |

**ELEMENT TYPE:**

|  |  |
| --- | --- |
| **Connectivity** | **Statistics** |
| TE4 | 57674 ( 100.00% ) |

**ELEMENT QUALITY:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Criterion** | **Good** | **Poor** | **Bad** | **Worst** | **Average** |
| Stretch | 14675 ( 25.44% ) | 40833 ( 70.80% ) | 2166 ( 3.76% ) | 0.007 | 0.217 |
| Aspect Ratio | 9435 ( 16.36% ) | 20243 ( 35.10% ) | 27996 ( 48.54% ) | 324.500 | 6.950 |

**Materials.1**

|  |  |
| --- | --- |
| **Material** | Steel |
| **Young's modulus** | 2e+011N\_m2 |
| **Poisson's ratio** | 0.266 |
| **Density** | 7860kg\_m3 |
| **Coefficient of thermal expansion** | 1.17e-005\_Kdeg |
| **Yield strength** | 2.5e+008N\_m2 |

**Static Case**

**Boundary Conditions**



Figure 1

**STRUCTURE Computation**

|  |  |  |  |
| --- | --- | --- | --- |
| Number of nodes | : | 17093 |   |
| Number of elements | : | 57674 |   |
| Number of D.O.F. | : | 51279 |   |
| Number of Contact relations | : | 0 |   |
| Number of Kinematic relations | : | 0 |   |

|  |  |  |  |
| --- | --- | --- | --- |
| Linear tetrahedron | : | 57674 |   |

**RESTRAINT Computation**

Name: Restraints.1

Number of S.P.C : 1146

**LOAD Computation**

Name: Loads.1

Applied load resultant :

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Fx | = | -1 | . | 513e-009 |  N |
| Fy | = | 2 | . | 654e-007 |  N |
| Fz | = | -1 | . | 000e+004 |  N |
| Mx | = | -8 | . | 829e+001 |  Nxm |
| My | = | 2 | . | 049e+004 |  Nxm |
| Mz | = | 5 | . | 439e-007 |  Nxm |

**STIFFNESS Computation**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of lines | : | 51279 |   |   |
| Number of coefficients | : | 923583 |   |   |
| Number of blocks | : | 2 |   |   |
| Maximum number of coefficients per bloc | : | 499978 |   |    |
| Total matrix size | : | 10 | . | 77 |  Mb |

**SINGULARITY Computation**

Restraint: Restraints.1

|  |  |  |  |
| --- | --- | --- | --- |
| Number of local singularities | : | 0 |   |
| Number of singularities in translation | : | 0 |   |
| Number of singularities in rotation | : | 0 |   |
| Generated constraint type | : | MPC |   |

**CONSTRAINT Computation**

Restraint: Restraints.1

|  |  |  |  |
| --- | --- | --- | --- |
| Number of constraints | : | 1146 |   |
| Number of coefficients | : | 0 |   |
| Number of factorized constraints | : | 1146 |   |
| Number of coefficients | : | 0 |   |
| Number of deferred constraints | : | 0 |   |

**FACTORIZED Computation**

|  |  |  |  |
| --- | --- | --- | --- |
| Method | : |  SPARSE |   |
| Number of factorized degrees | : | 50133 |   |   |
| Number of supernodes | : | 2662 |   |   |
| Number of overhead indices | : | 179118 |   |   |
| Number of coefficients | : | 5333547 |   |   |
| Maximum front width | : | 612 |   |   |
| Maximum front size | : | 187578 |   |   |
| Size of the factorized matrix (Mb) | : | 40 | . | 6917 |   |
| Number of blocks | : | 6 |   |   |
| Number of Mflops for factorization | : | 9 | . | 374e+002 |   |
| Number of Mflops for solve | : | 2 | . | 158e+001  |   |
| Minimum relative pivot | : | 2 | . | 739e-005  |   |

Minimum and maximum pivot

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Value** | **Dof** | **Node** | **x (in)**  | **y (in)**  | **z (in)**  |
| 2.7612e+006 | Tz | 17087 | 2.0529e+001 | -8.9101e+000 | 2.5025e+001 |
| 2.9428e+011 | Tx | 10013 | 2.1285e+001 | -1.6754e+001 | 4.6799e-001 |

Minimum pivot

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Value** | **Dof** | **Node** | **x (in)**  | **y (in)**  | **z (in)**  |
| 3.7262e+006 | Tz | 17093 | 1.7783e+001 | 1.0867e+001 | 2.1333e+001 |
| 4.2227e+006 | Ty | 17087 | 2.0529e+001 | -8.9101e+000 | 2.5025e+001 |
| 4.3679e+006 | Tz | 17037 | 8.9856e+000 | 4.8431e+000 | 2.8950e-001 |
| 5.2531e+006 | Tz | 7640 | 5.4691e+001 | 1.2797e+001 | 1.8683e+001 |
| 5.3073e+006 | Ty | 17034 | 7.7362e+000 | 5.0407e+000 | -3.4968e-017 |
| 5.4094e+006 | Ty | 17083 | 6.9047e+000 | 7.0836e+000 | -5.3126e-001 |
| 5.9717e+006 | Ty | 17091 | 1.8135e+001 | 1.0590e+001 | 2.1234e+001 |
| 6.4019e+006 | Tz | 17089 | 8.1221e+001 | 7.3383e+000 | 1.3047e+001 |
| 7.0463e+006 | Tz | 17083 | 6.9047e+000 | 7.0836e+000 | -5.3126e-001 |

Translational pivot distribution

|  |  |
| --- | --- |
| **Value** | **Percentage** |
| 10.E6 --> 10.E7 | 3.3910e-002 |
| 10.E7 --> 10.E8 | 3.2115e-001 |
| 10.E8 --> 10.E9 | 7.0353e+000 |
| 10.E9 --> 10.E10 | 5.7577e+001 |
| 10.E10 --> 10.E11 | 3.4397e+001 |
| 10.E11 --> 10.E12 | 6.3631e-001 |

**DIRECT METHOD Computation**

Name: Static Case Solution.1

Restraint: Restraints.1

Load: Loads.1

Strain Energy : 7.699e+001 J

Equilibrium

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **AppliedForces** | **Reactions** | **Residual** | **RelativeMagnitude Error** |
| Fx (N) | -1.5134e-009 | 1.8726e-006 | 1.8711e-006 | 6.1618e-011 |
| Fy (N) | 2.6543e-007 | -2.4502e-006 | -2.1848e-006 | 7.1949e-011 |
| Fz (N) | -1.0000e+004 | 1.0000e+004 | 2.1043e-005 | 6.9300e-010 |
| Mx (Nxm) | -8.8293e+001 | 8.8293e+001 | 1.5465e-006 | 2.4682e-011 |
| My (Nxm) | 2.0487e+004 | -2.0487e+004 | -3.4488e-005 | 5.5041e-010 |
| Mz (Nxm) | 5.4393e-007 | -3.4417e-006 | -2.8978e-006 | 4.6246e-011 |

**Static Case Solution.1 - Deformed mesh.2**



Figure 2

On deformed mesh ---- On boundary ---- Over all the model

**Static Case Solution.1 - Von Mises stress (nodal values).2**



Figure 3

3D elements: : Components: : All

On deformed mesh ---- On boundary ---- Over all the model

**Global Sensors**

|  |  |
| --- | --- |
| **Sensor Name** | **Sensor Value** |
| Energy | 76.987J |
| Global Error Rate (%) | 31.805156708 |