COSMOSWorks Practice

2008. 10. 1 컴퓨터 이용 설계 및 제작

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Human-Centered CAD Lab.

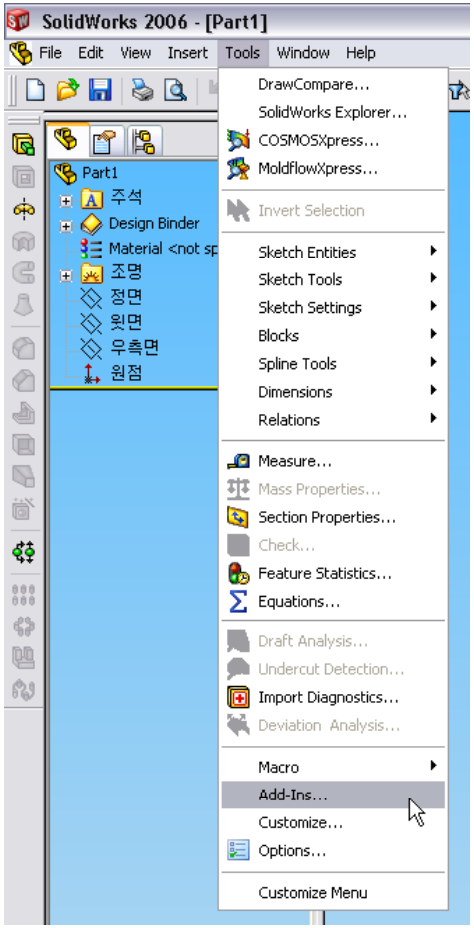
What to Learn?

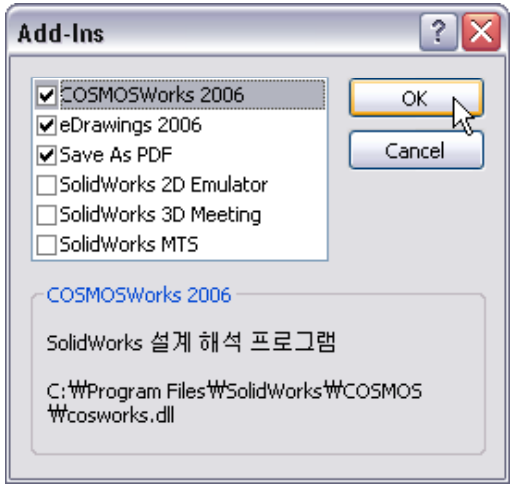
- COSMOSWorks in Solidworks
- Static Analysis
- Frequency Analysis
- Contact Analysis
- Buckling Analysis

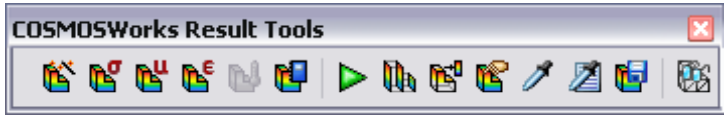
COSMOSWorks in Solidworks

Add-in / Toolbar

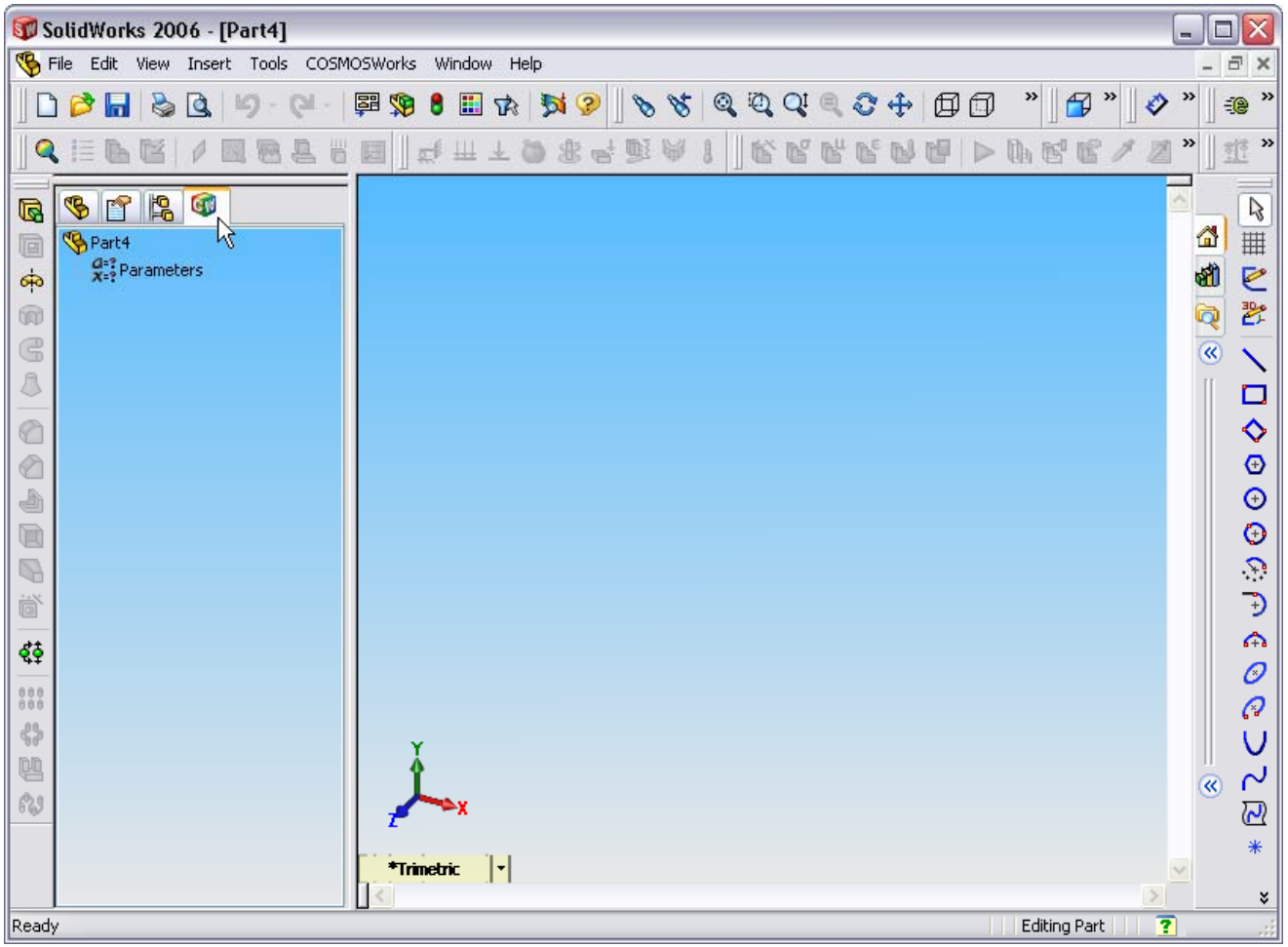
Tool >> Add-in >> COSMOSWorks







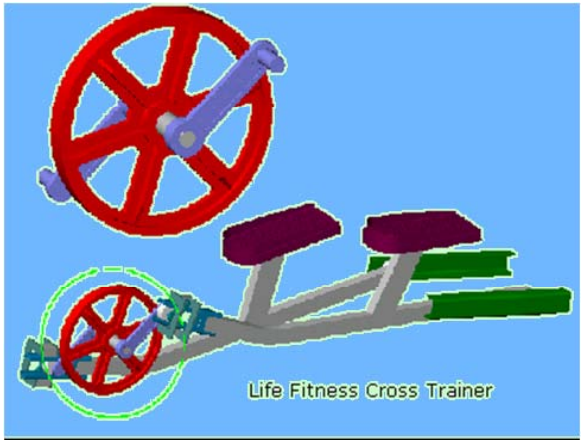
COSMOSWorks Manager



Static Analysis

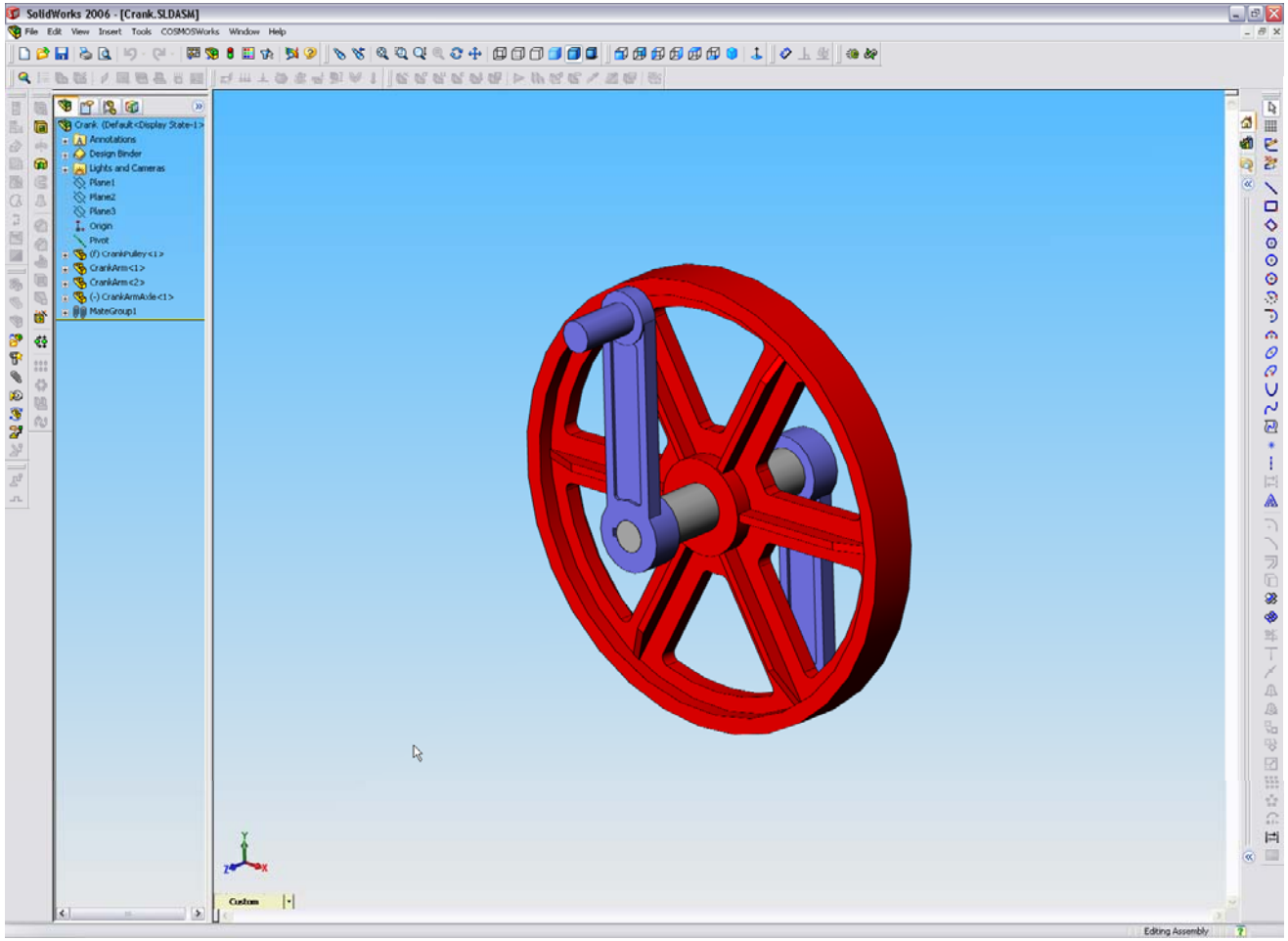
Procedure

- Create a static analysis study
- Assign materials to the various components of the assembly
- Insert restraints and loads
- Mesh the assembly
- Run static analysis
- Visualize the static analysis result



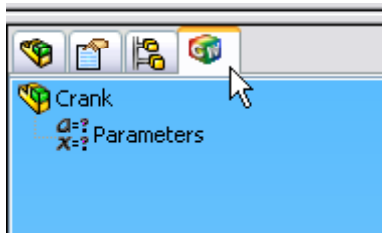
Open

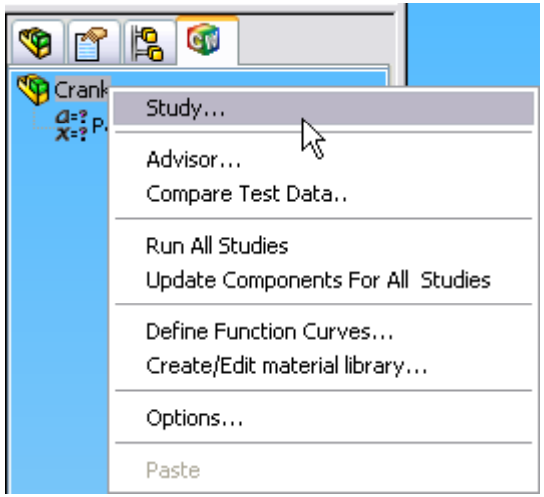
Crank.SLDASM

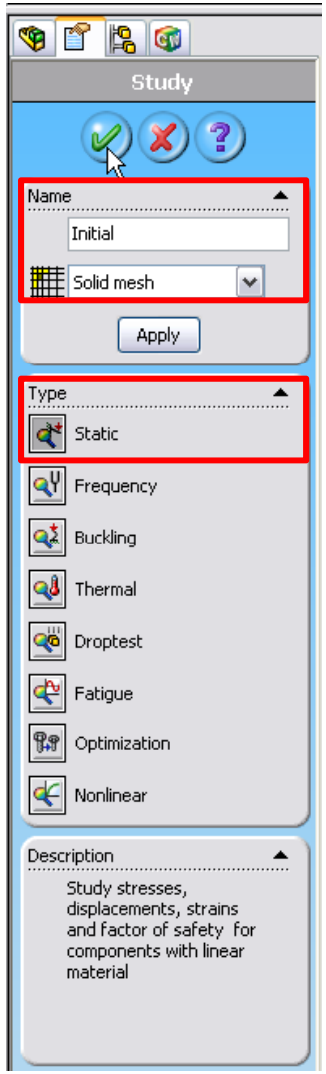


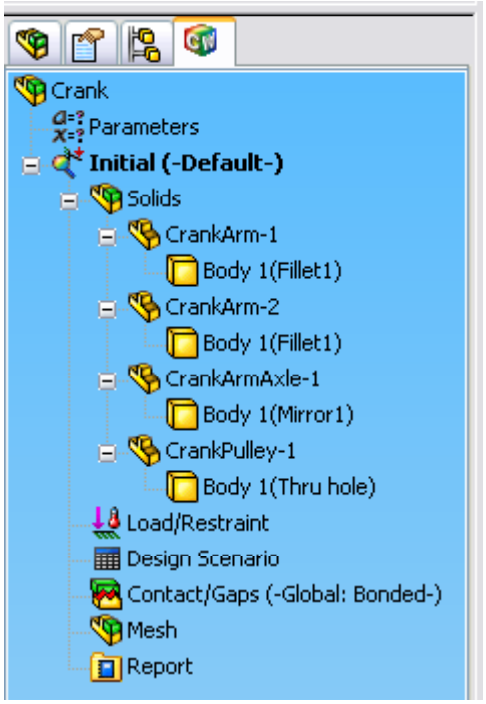
Create a Study

Study >> Solid Mesh & Static



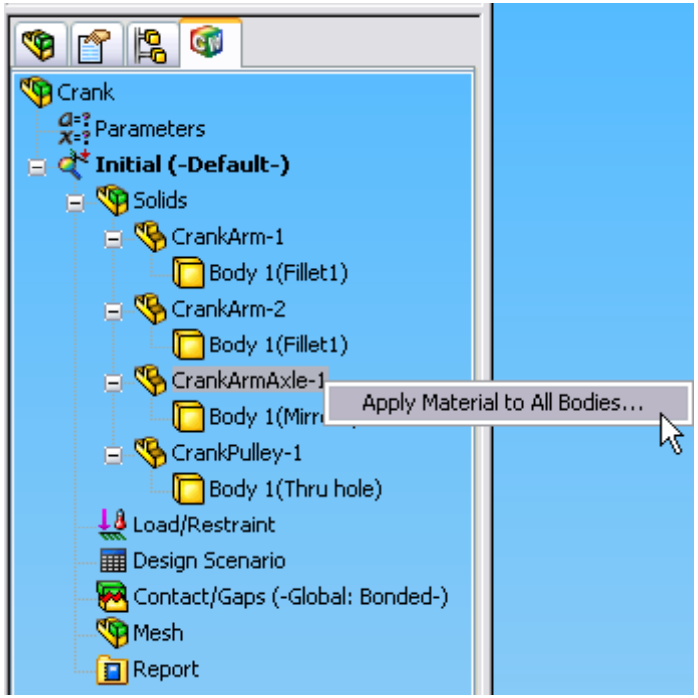


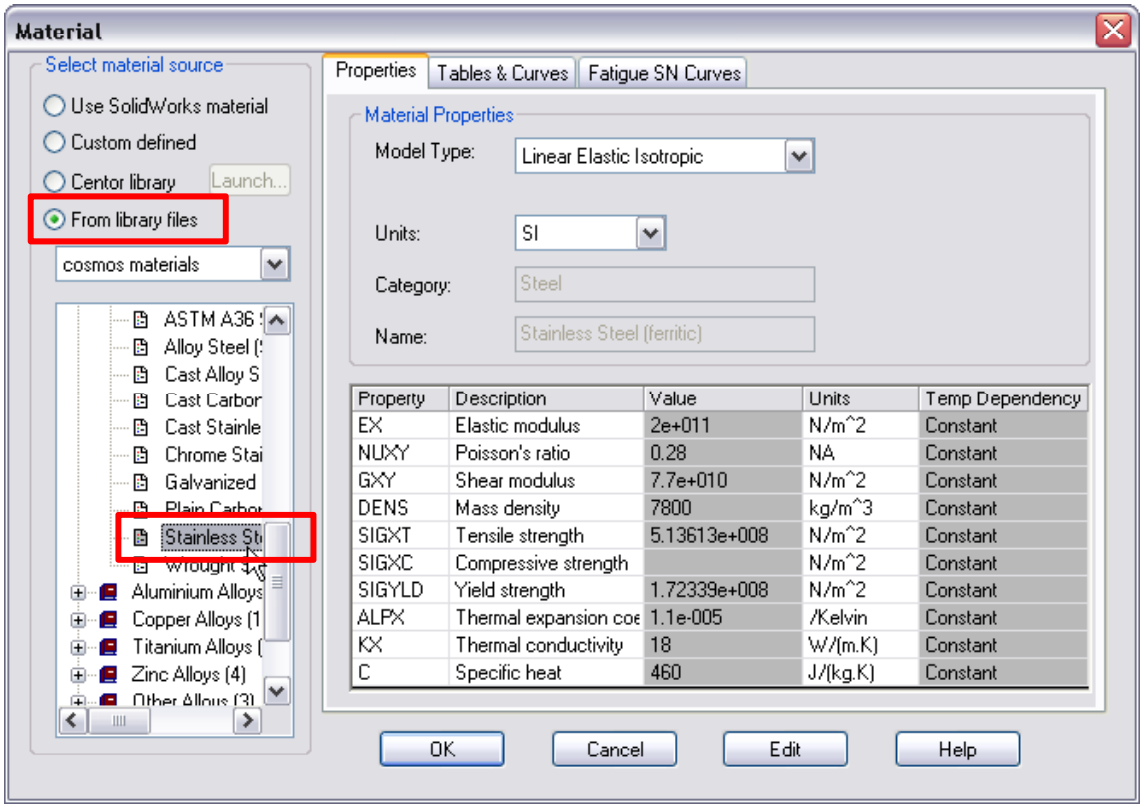




Apply Materials

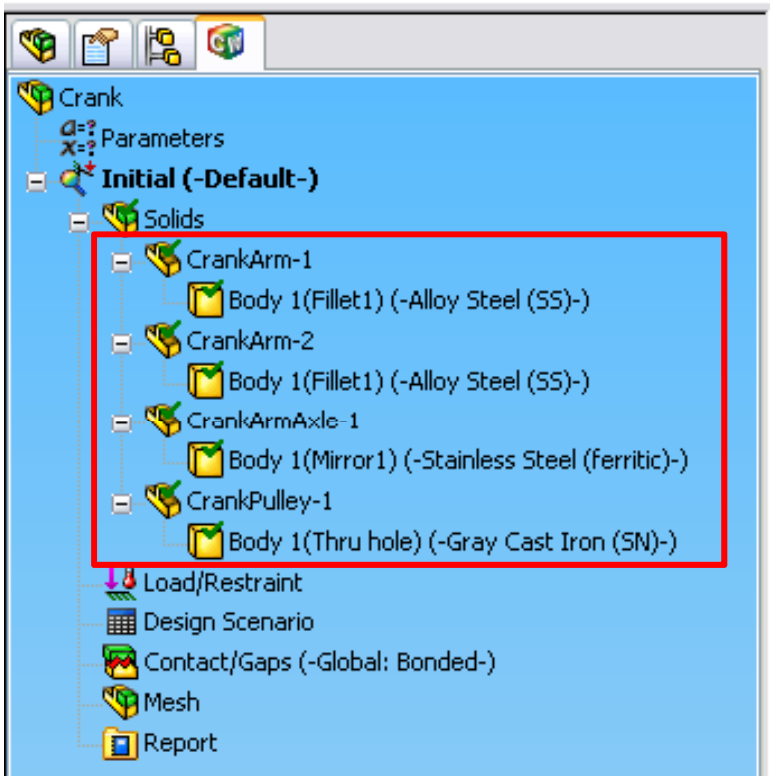
CrankArmAxle-1 >> Apply Material to All Bodies >> Steel >> Stainless Steel





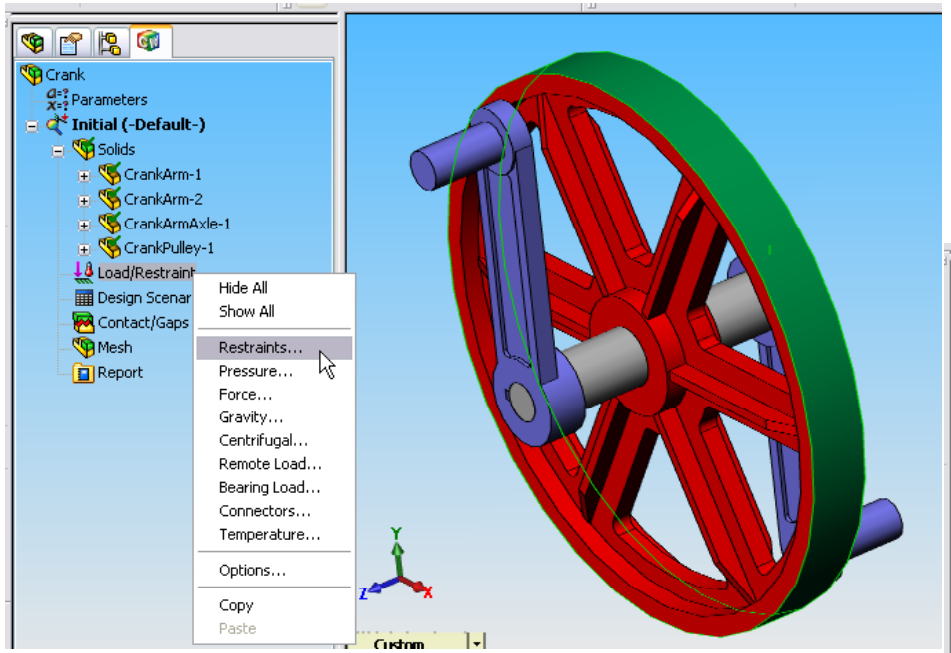
Apply Materials

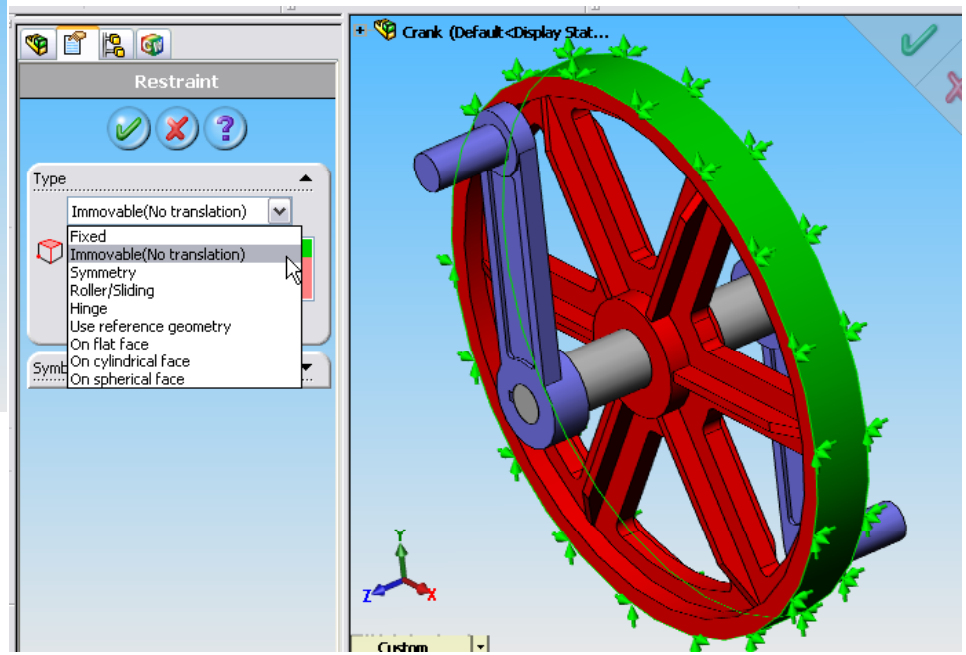
- CrankPully-1
  - Gray Cast Iron
- CrankArm-1
  - Alloy Steel
- CrankArm-2
  - Alloy Steel



Apply Restraint - Immovable

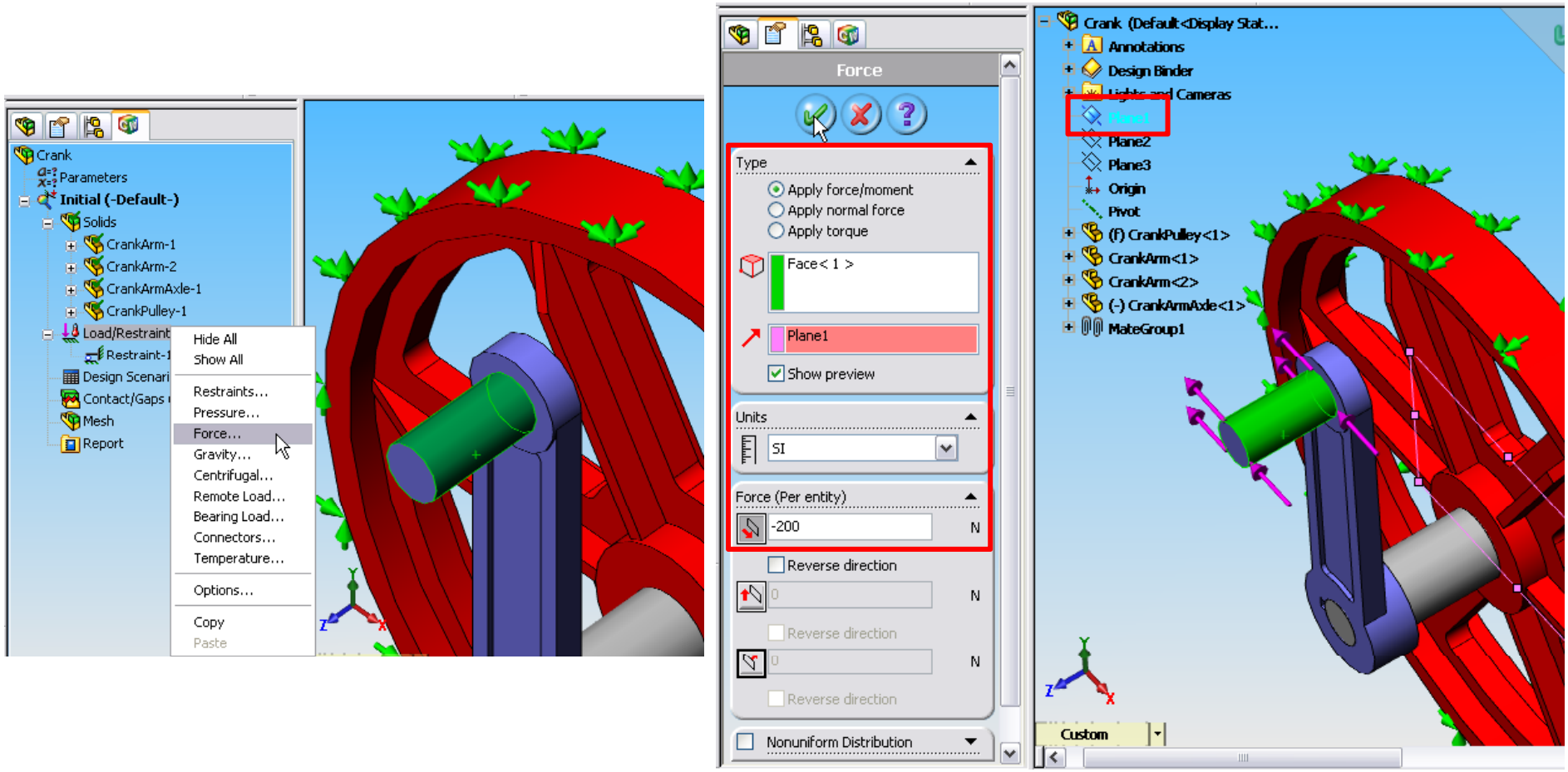
Load/Restraints >> Restraints >> Immovable





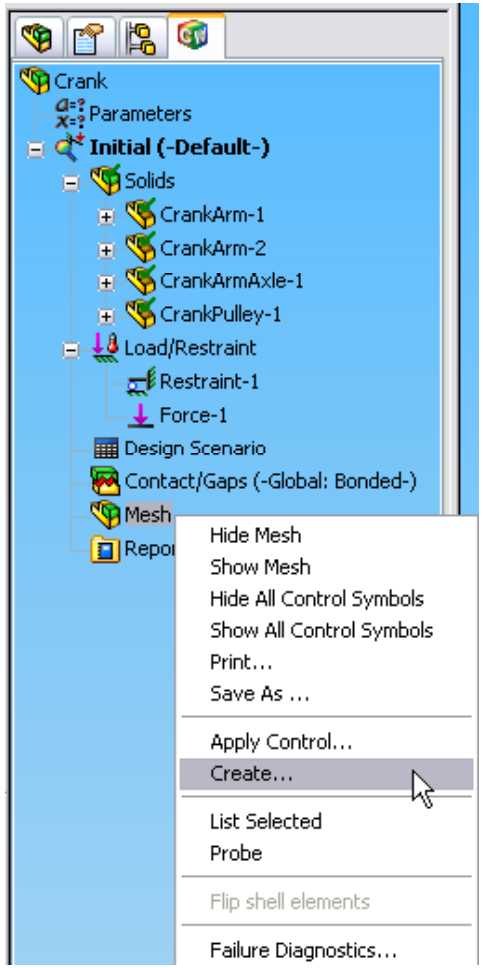
Apply Force

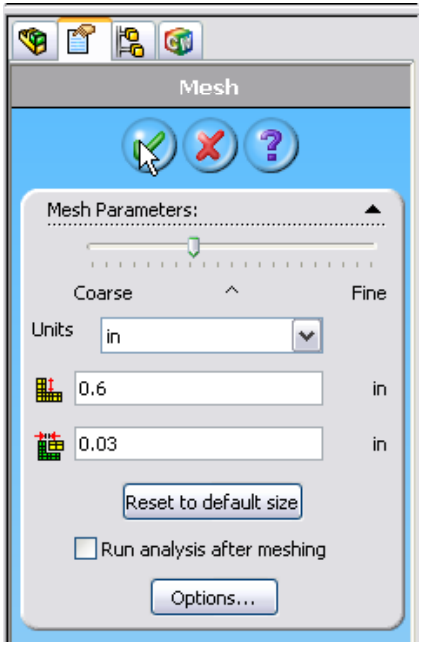
Load/Restraints >> Force >> Along direction >> - 200N

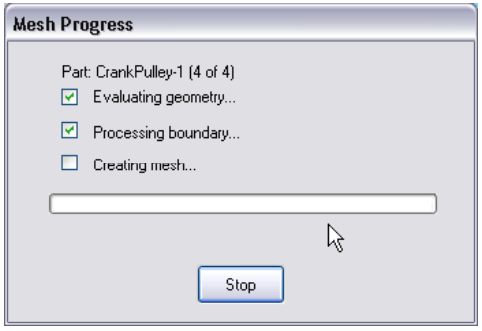


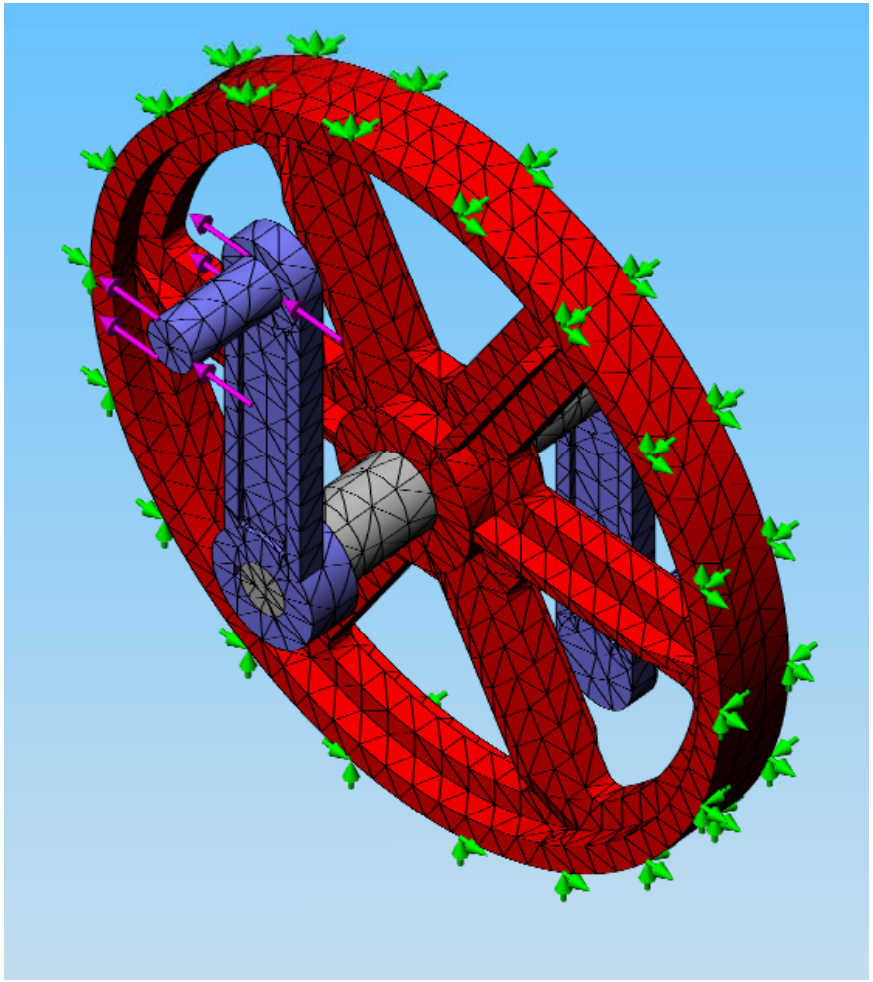
Create Mesh

Mesh >> Create >> Global Size 0.6 in



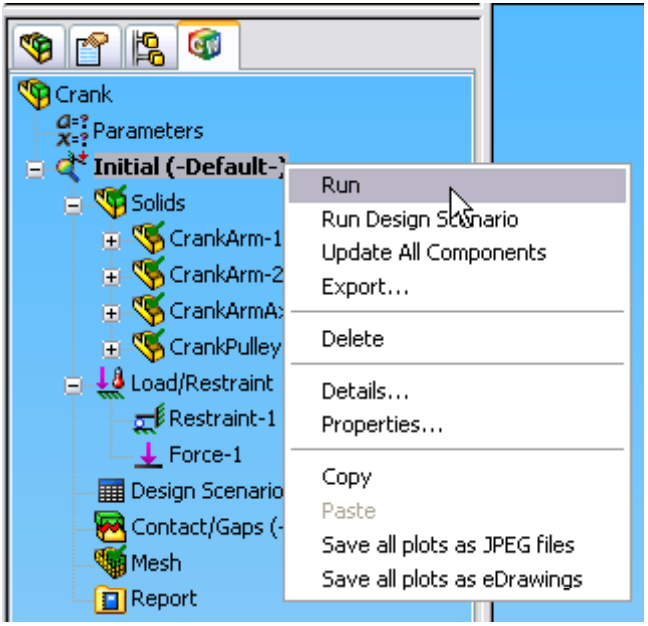


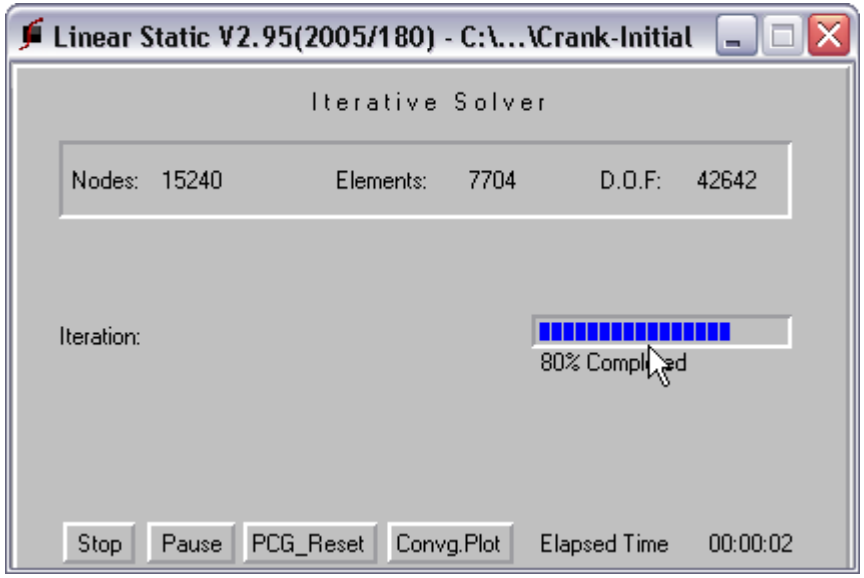




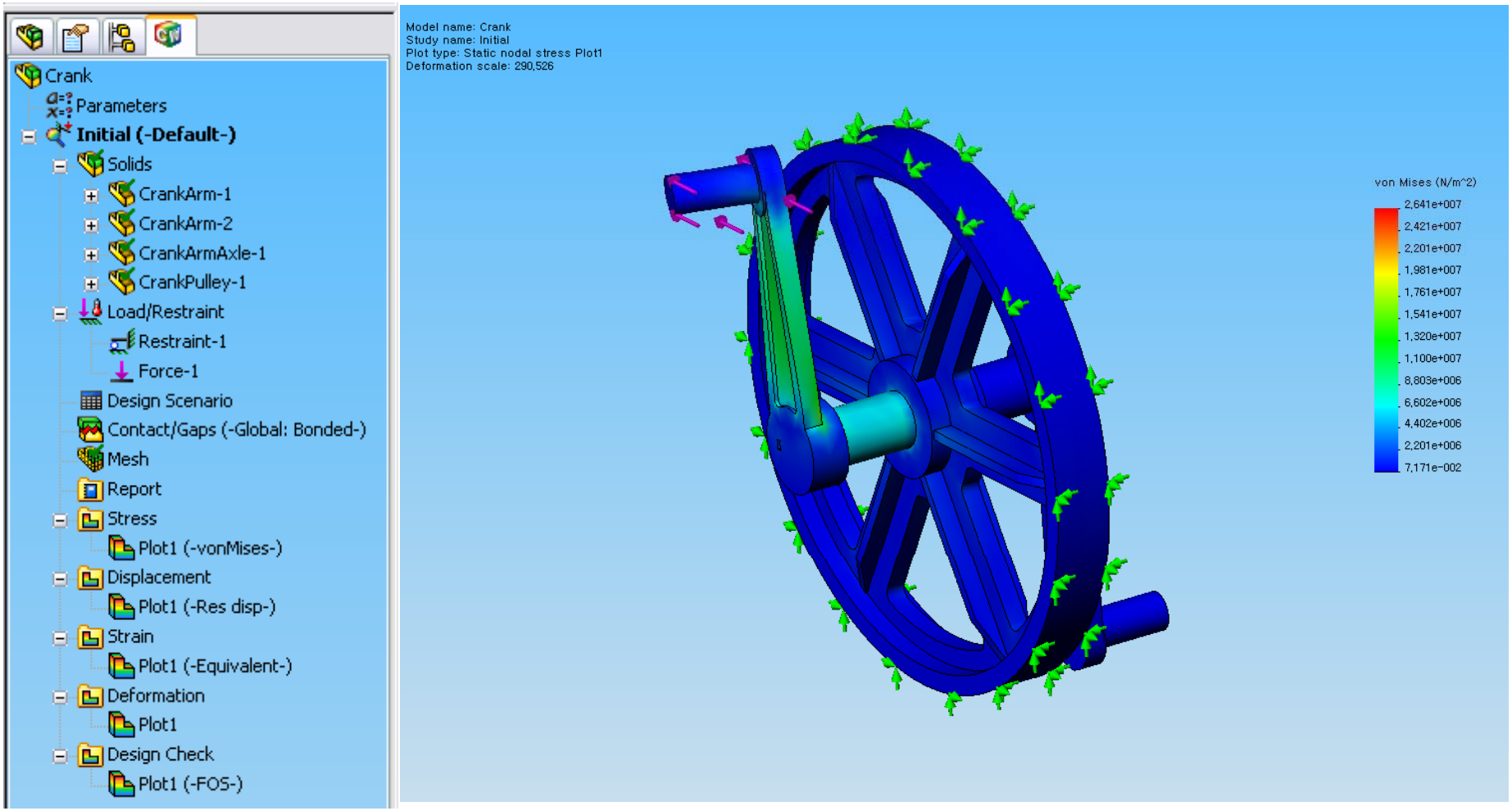
Run Static Analysis

Study >> Run



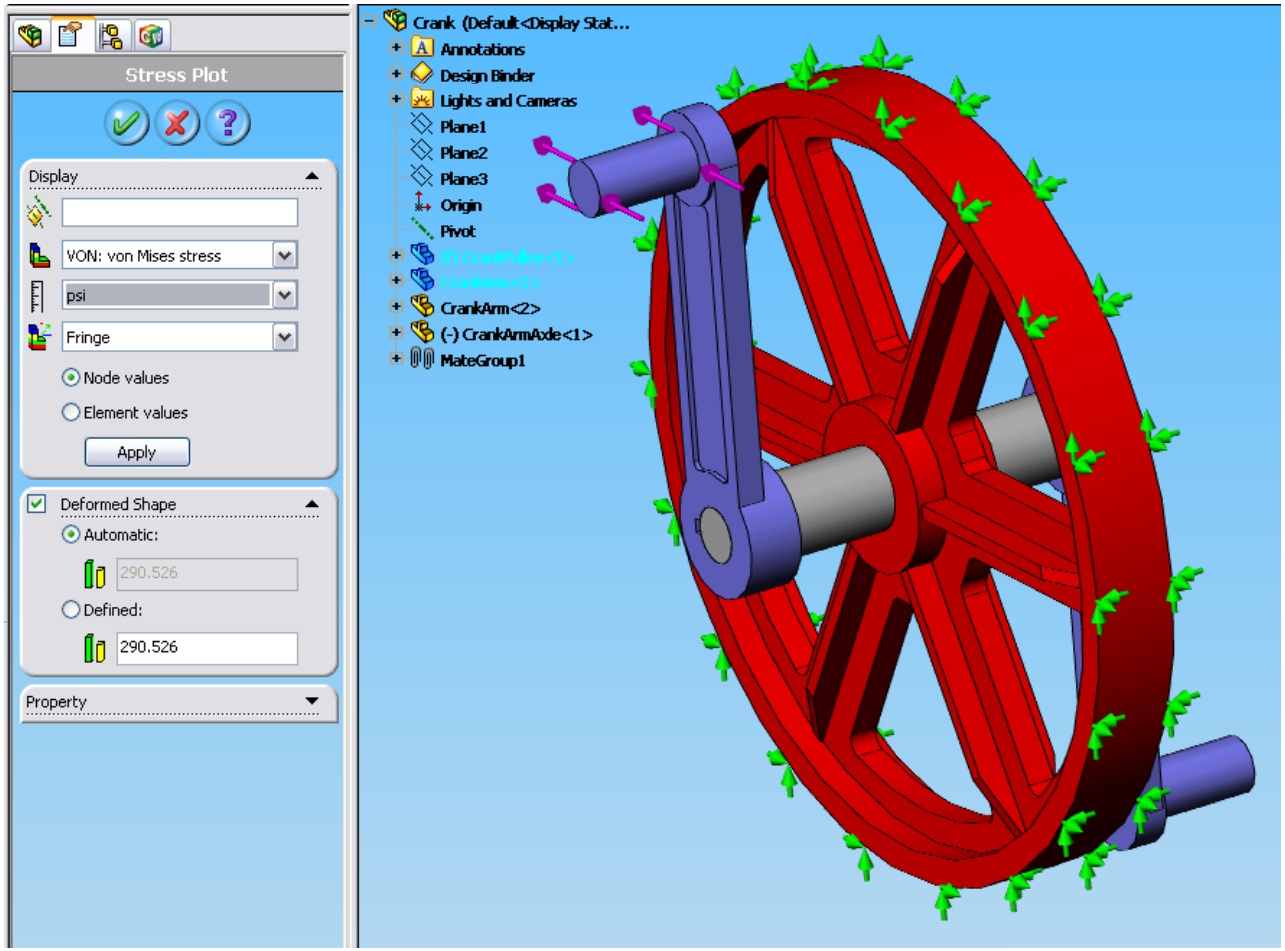


Stress Plot


Crank
Parameters
Initial (-Default-)
Solids
CrankArm-1
CrankArm-2
CrankArmAxle-1
CrankPulley-1
Load/Restraint
Restraint-1
Force-1
Design Scenario
Contact/Gaps (-Global: Bonded-)
Mesh
Report
Stress
Plot1 (-vonMises-)
Displacement
Plot1 (-Res disp-)
Strain
Plot1 (-Equivalent-)
Deformation
Plot1
Design Check
Plot1 (-FOS-)
Model name: Crank
Study name: Initial
Plot type: Static nodal stress Plot1
Deformation scale: 290,526
von Mises (N/m^2)
2,641e+007
2,421e+007
2,201e+007
1,981e+007
1,761e+007
1,541e+007
1,320e+007
1,100e+007
8,803e+006
6,602e+006
4,402e+006
2,201e+006
7,171e-002

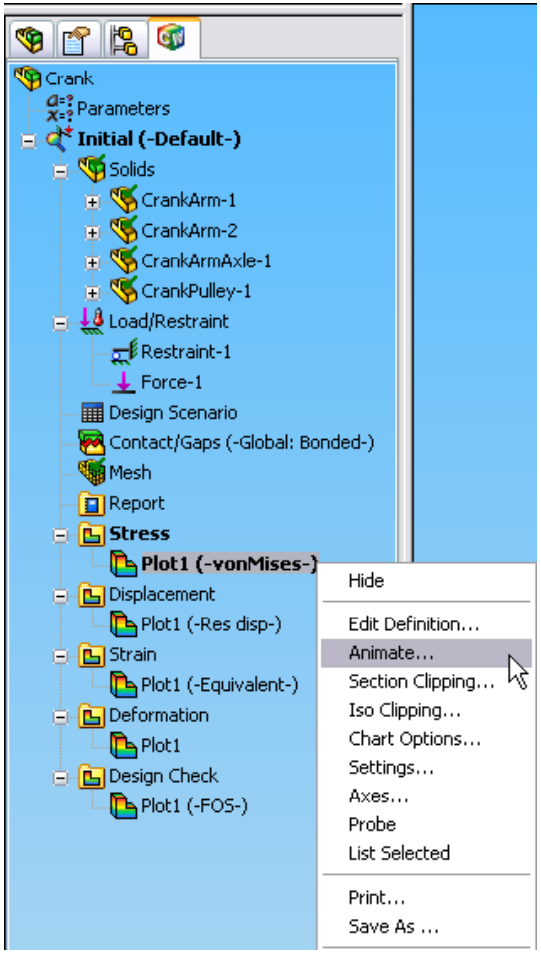
Change Unit - psi

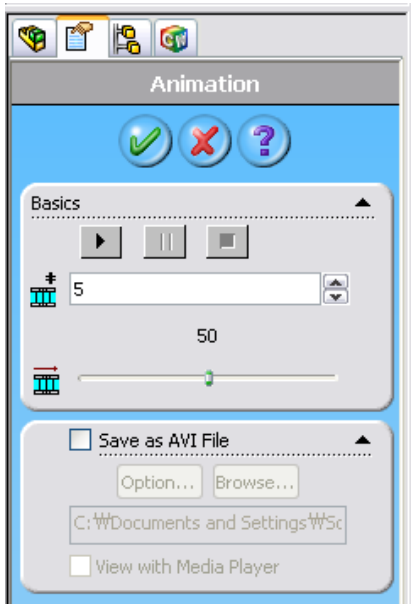
Plot1 >> Edit Definition >> psi

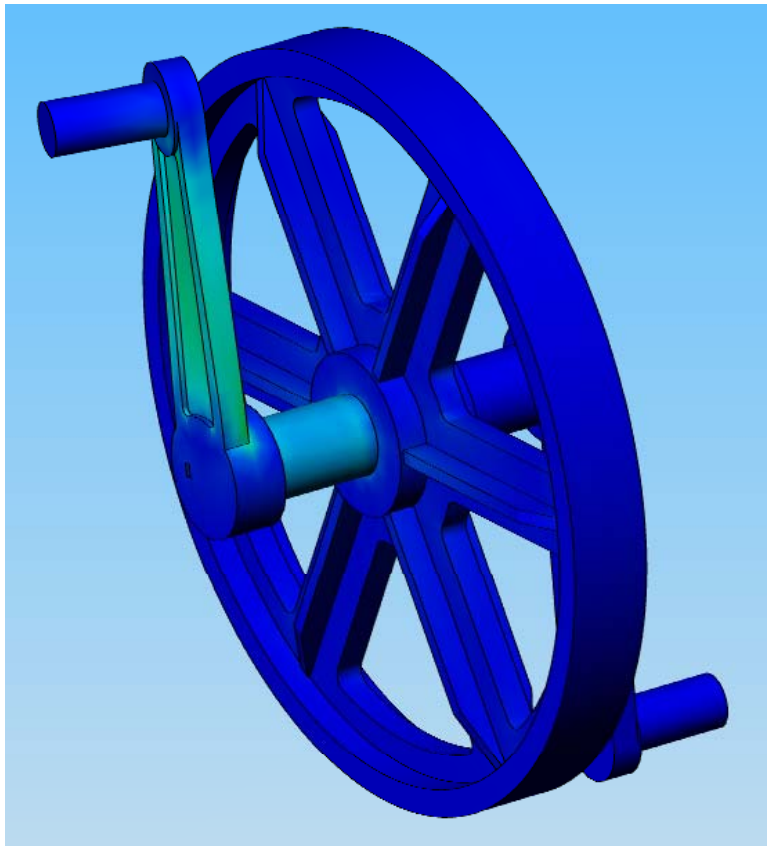


Animate

Plot1 >> Animate

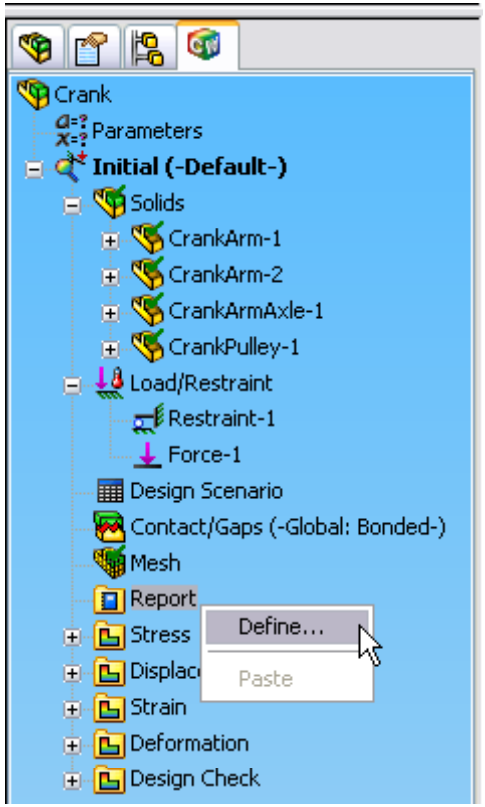


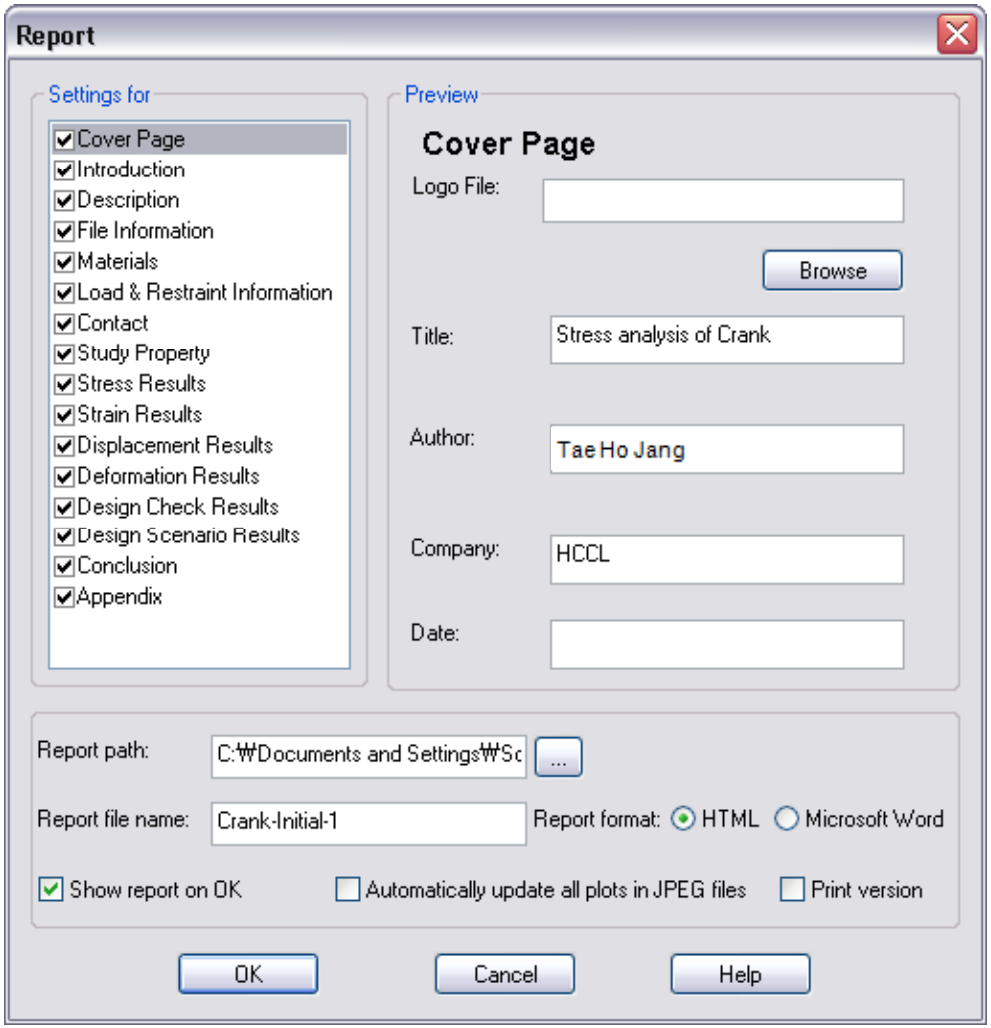




Generating Report

Report >> Define





Report Example

Stress analysis of Crank

Author: Tae-guen Son

Company: HCCL

7. Stress Results

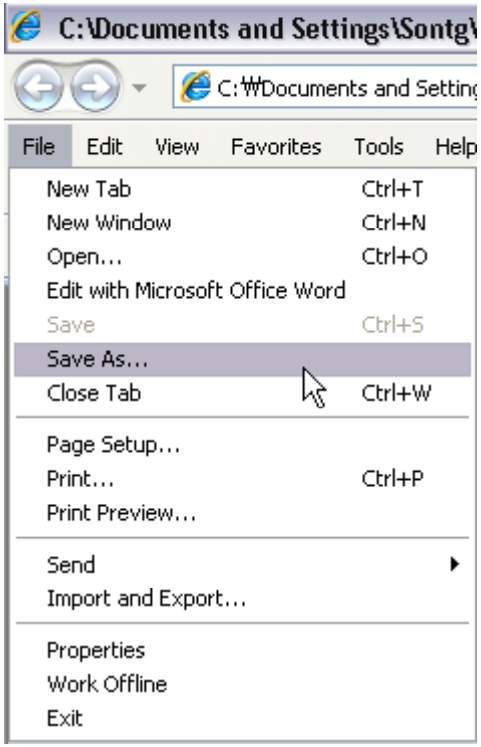
Name	Type	Min	Location	Max	Location
Plot1	VON: von Mises stress	0.0717146 N/m^2 Node: 3327	(0.265 in, -4.22274 in, -3.684 in)	2.64092e+007 N/m^2 Node: 1911	(0.641187 in, 0.905819 in, 3.434 in)

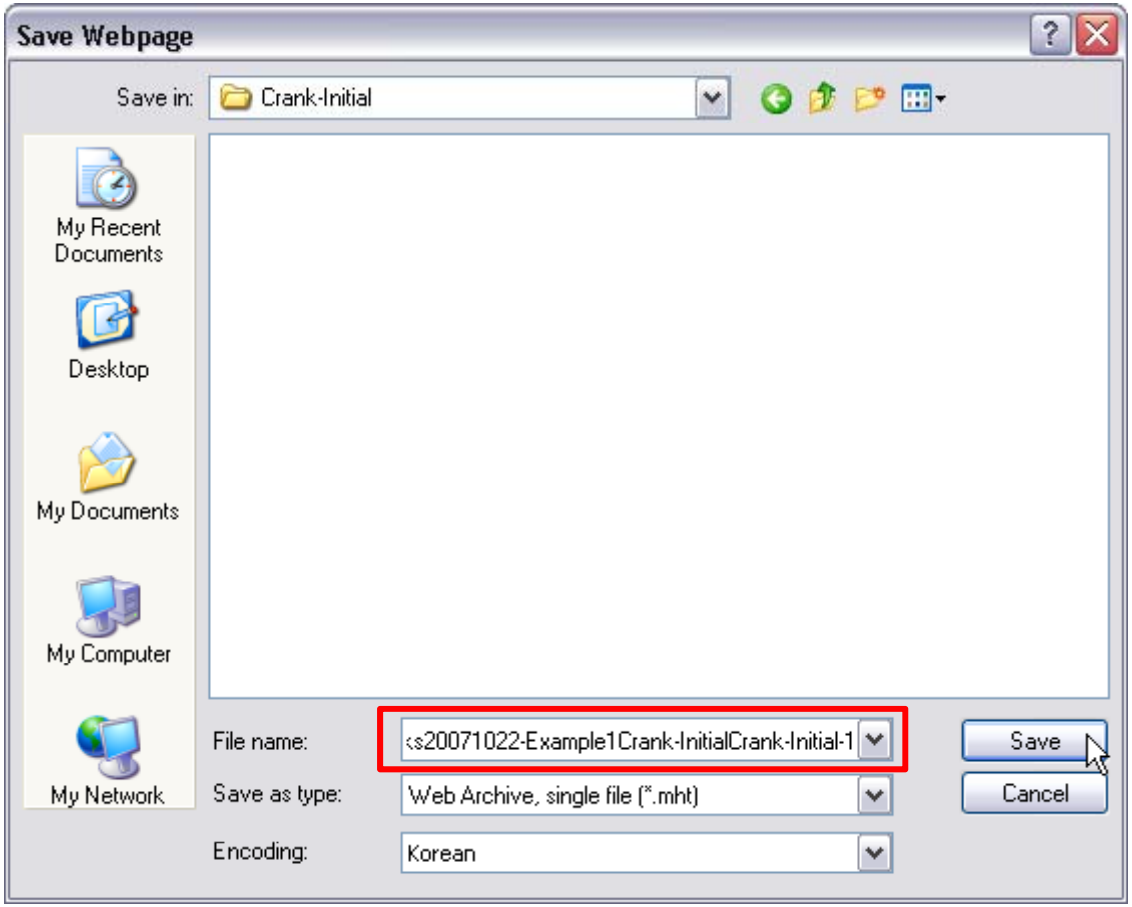
3. Materials

No.	Part Name	Material	Mass	Volume
1	CrankArm-1	Alloy Steel (SS)	1.17195 kg	0.000152201 m^3
2	CrankArm-2	Alloy Steel (SS)	1.17195 kg	0.000152201 m^3
3	CrankArmAxle-1	Stainless Steel (ferritic)	1.52621 kg	0.000195668 m^3
4	CrankPulley-1	Gray Cast Iron (SN)	9.25209 kg	0.00128501 m^3

Save Report as Web Page

File >> Save As >> .mht

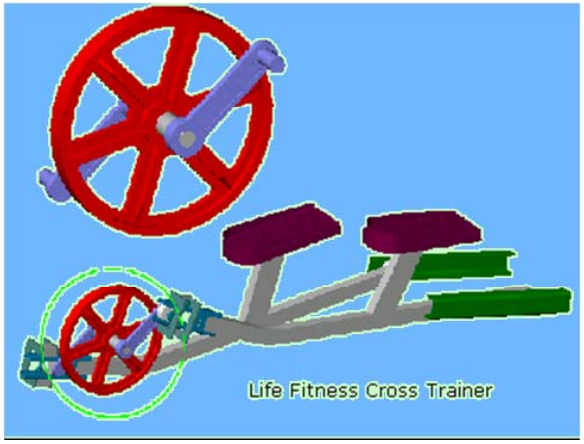




Frequency Analysis

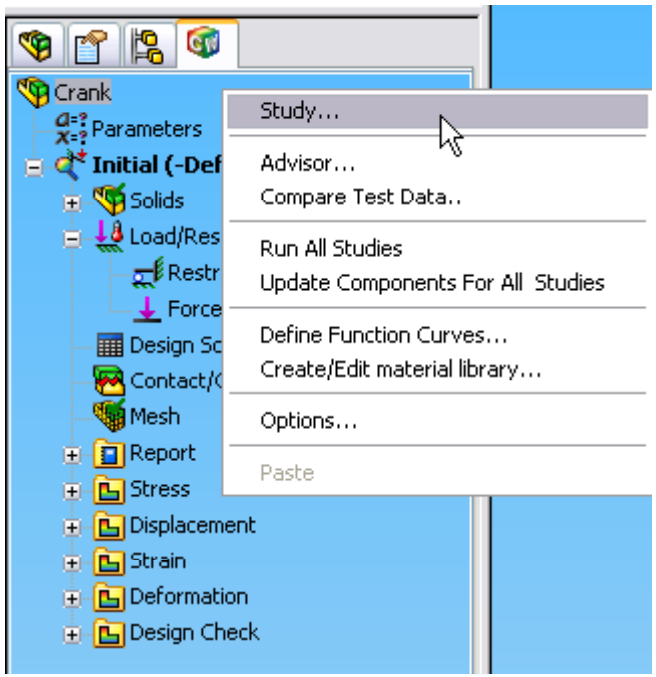
Procedure

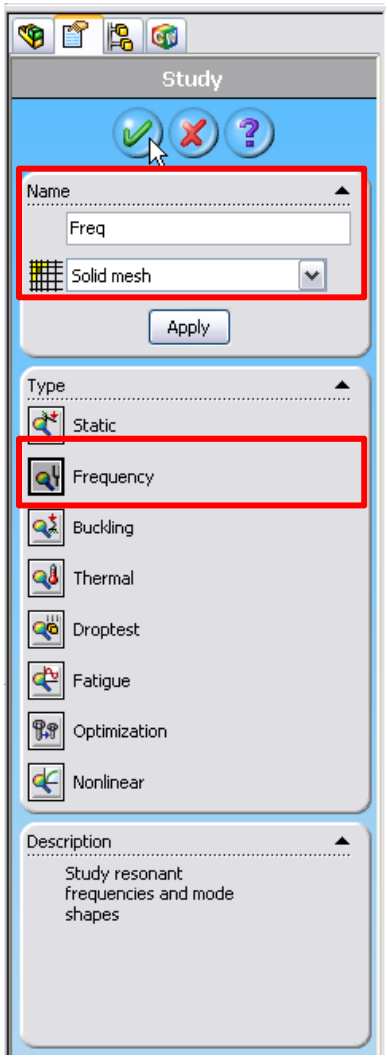
- Create a frequency analysis study
- Run frequency analysis
- Visualize frequency analysis study

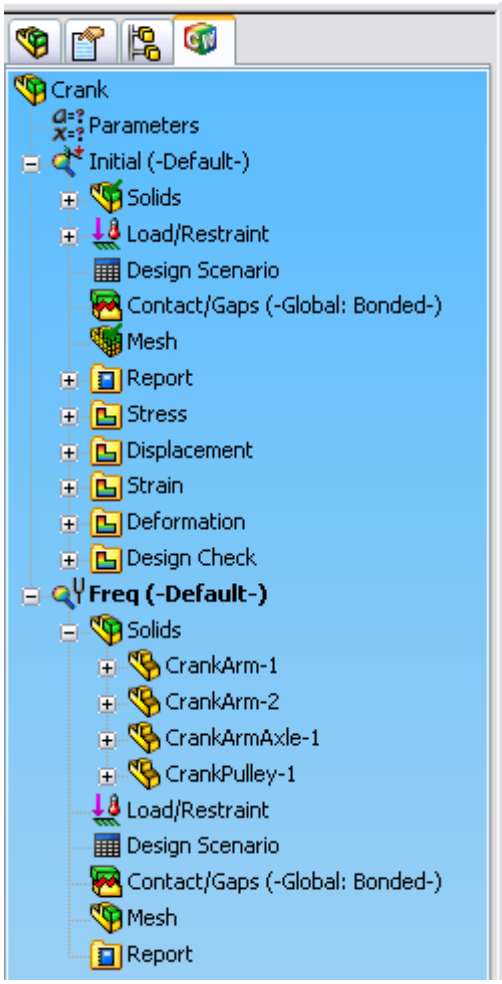


Add New Study

Study >> Solid Mesh & Frequency

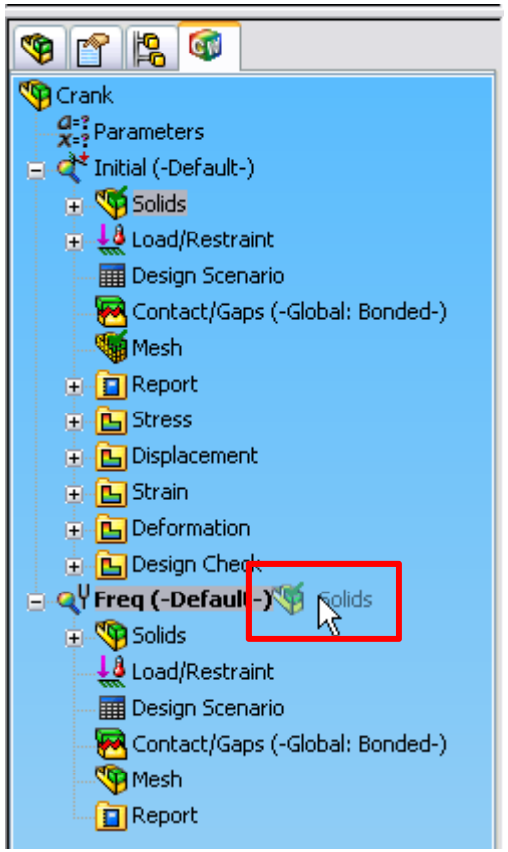


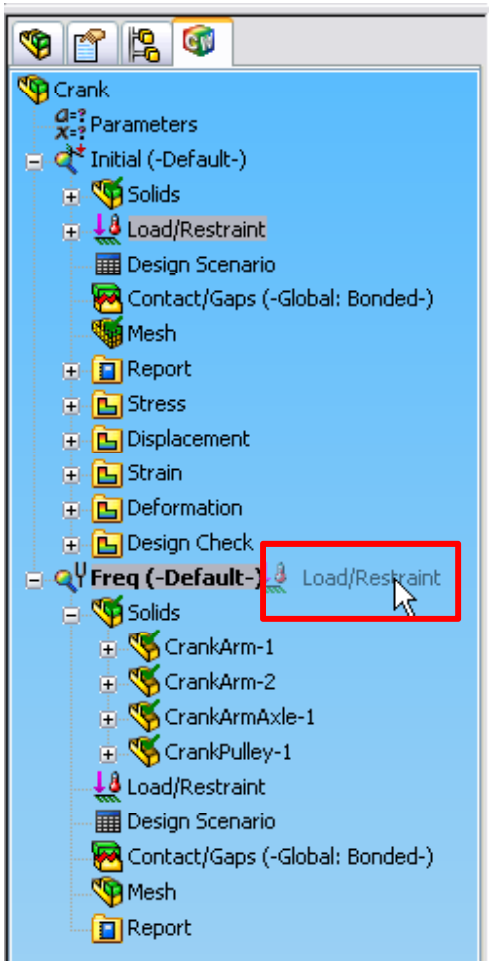


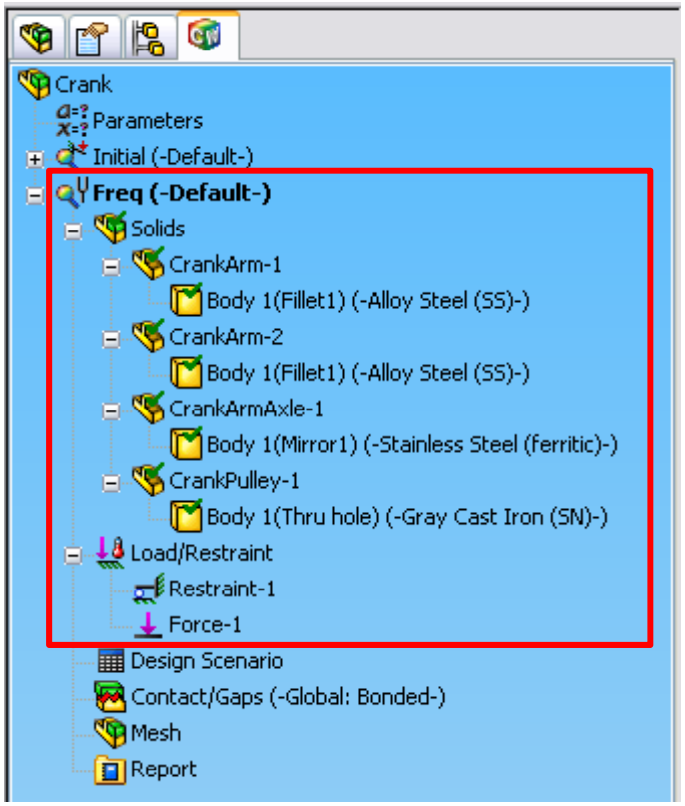


Drag & Drop

Apply Materials, Restraints and Force

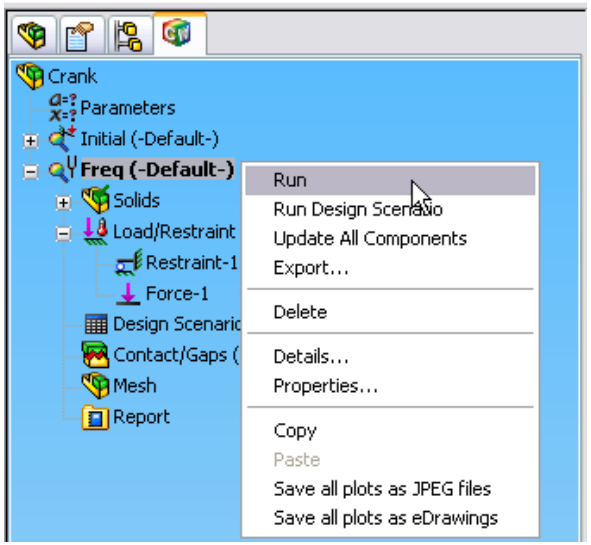


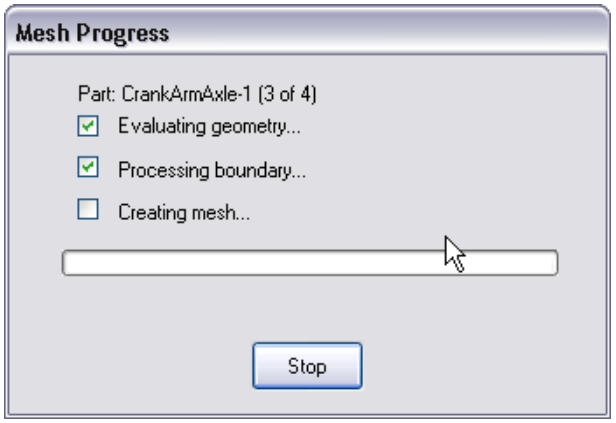


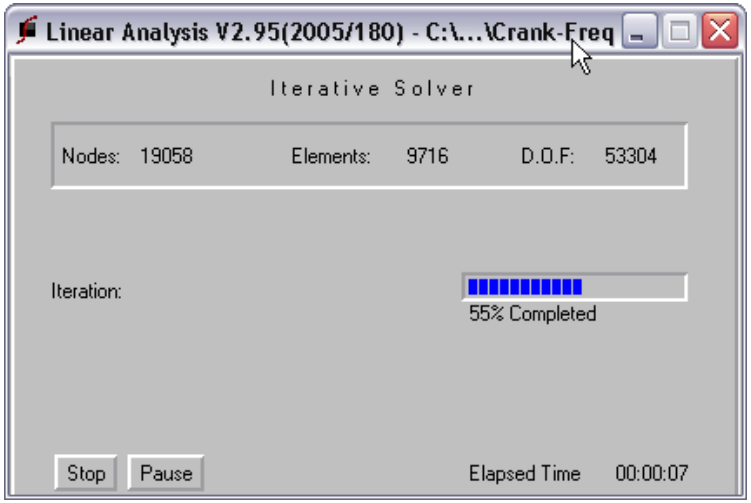


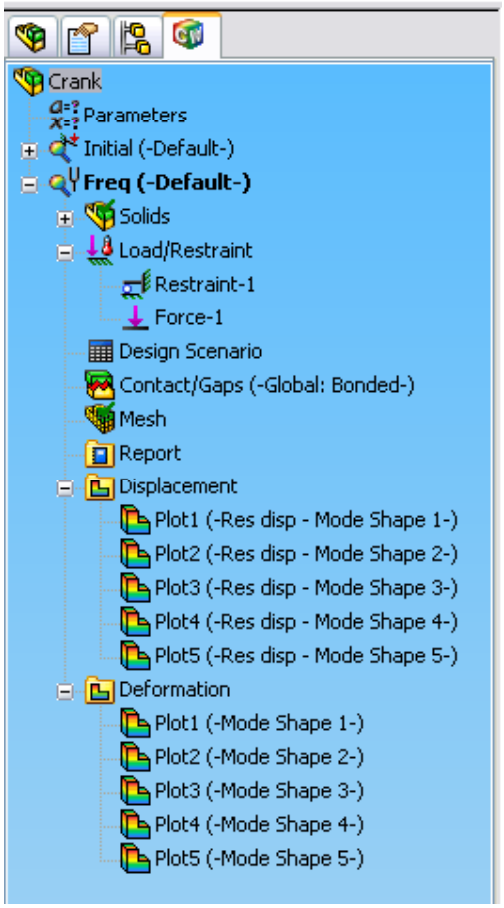
Run Frequency Analysis

Freq >> Run



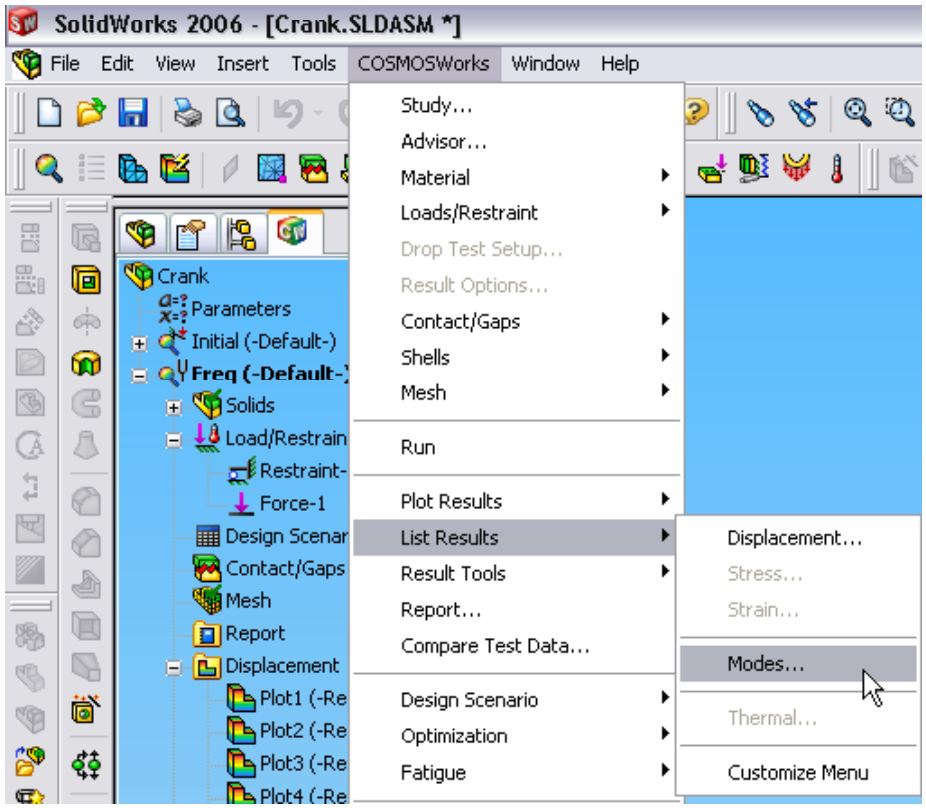


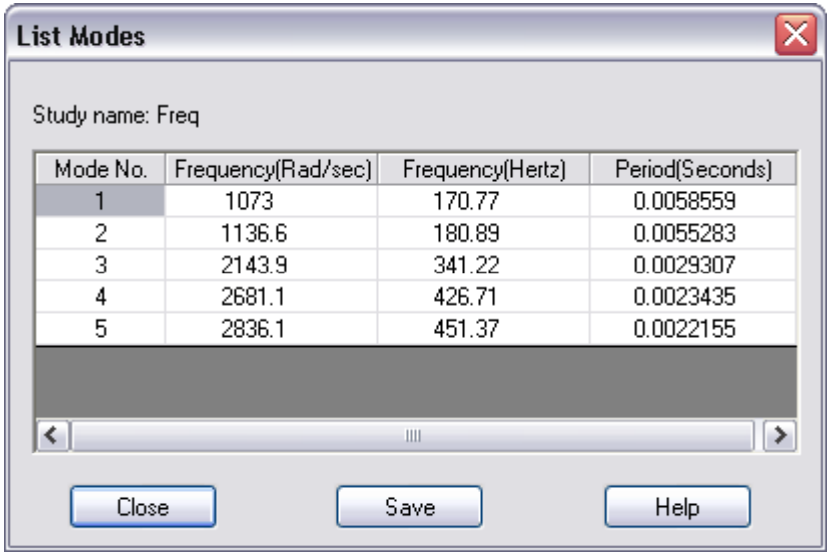




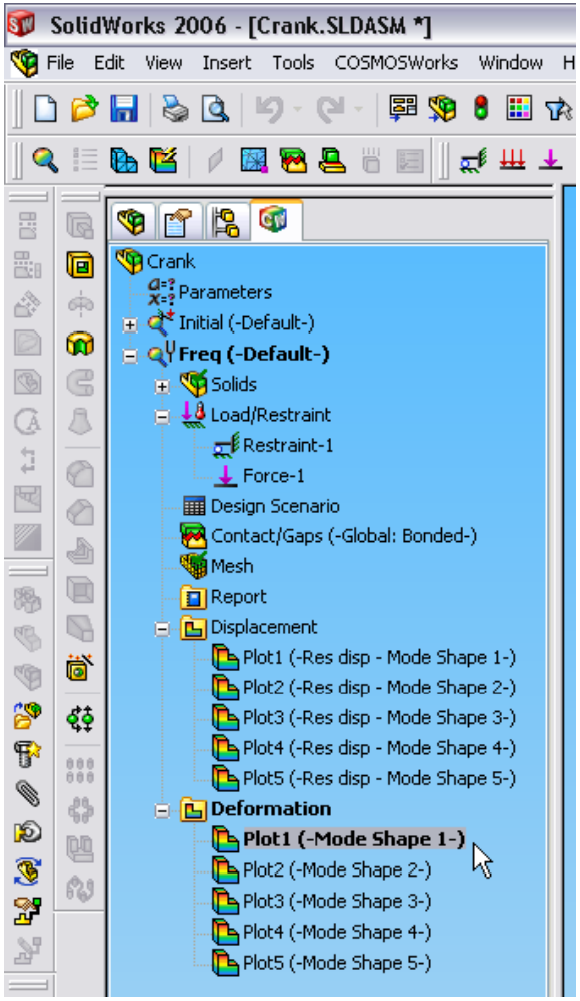
List Result - Mode Shape

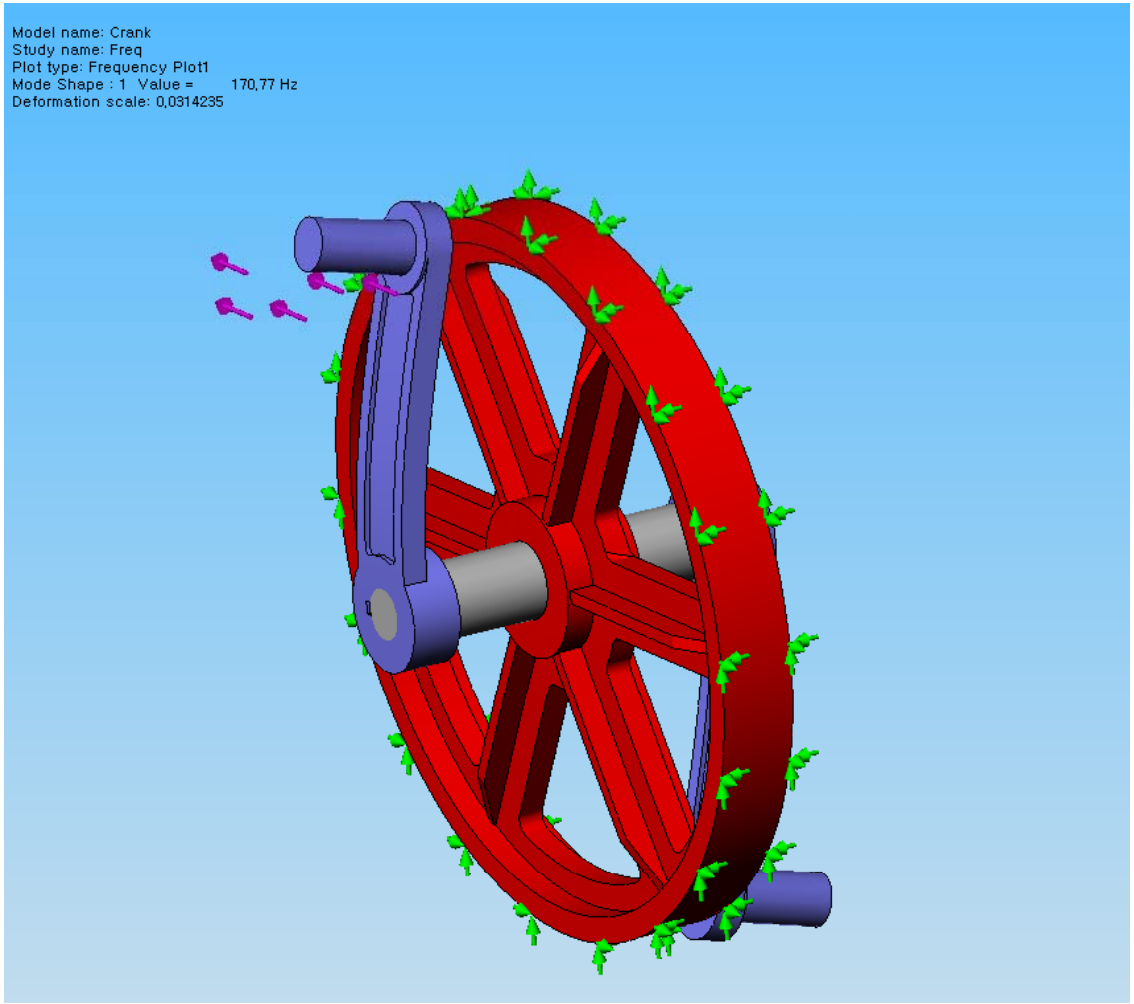
COSMOSWorks >> List Results >> Modes





Deformation Plot

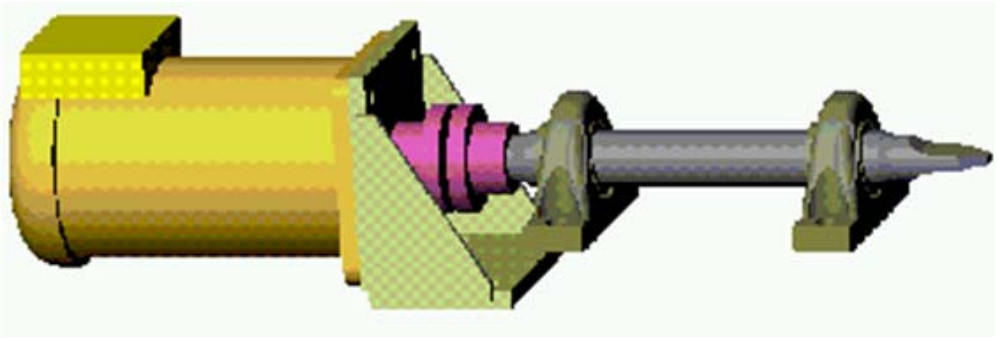




Contact Analysis

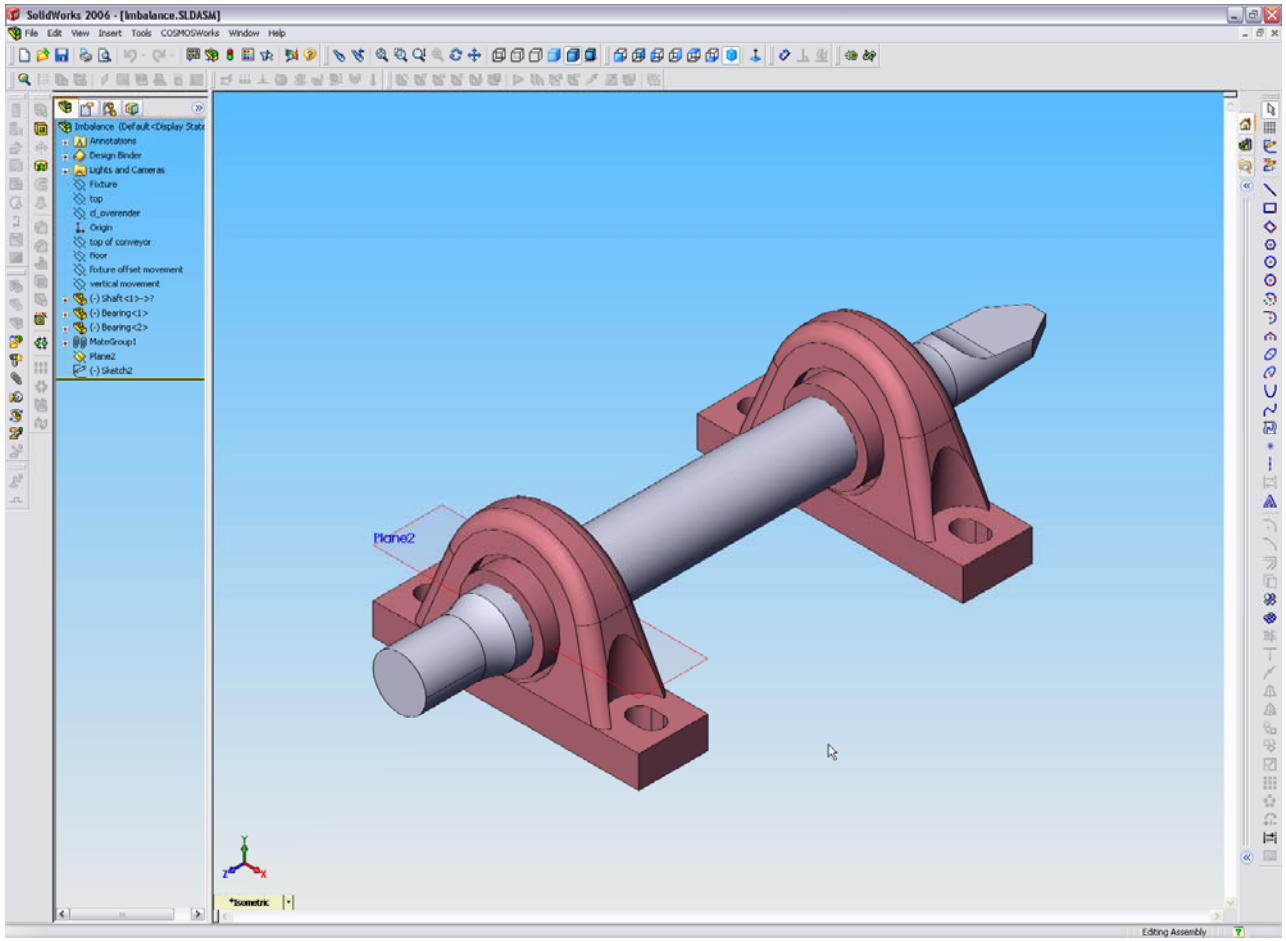
Procedure

- Set a global Contact/Gaps options
- Mesh an assembly
- Run static analysis
- Visualize the stress results



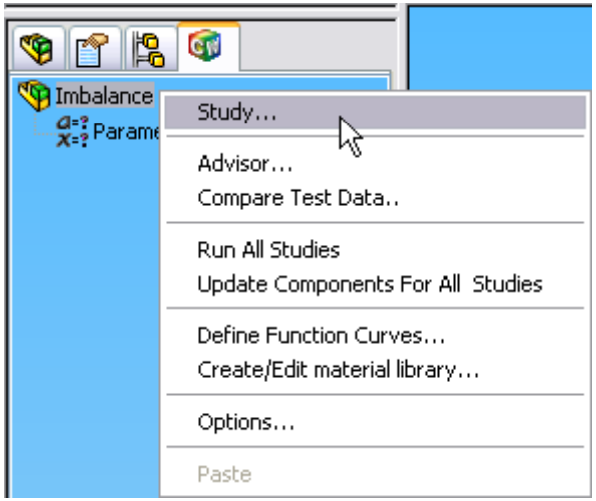
Open

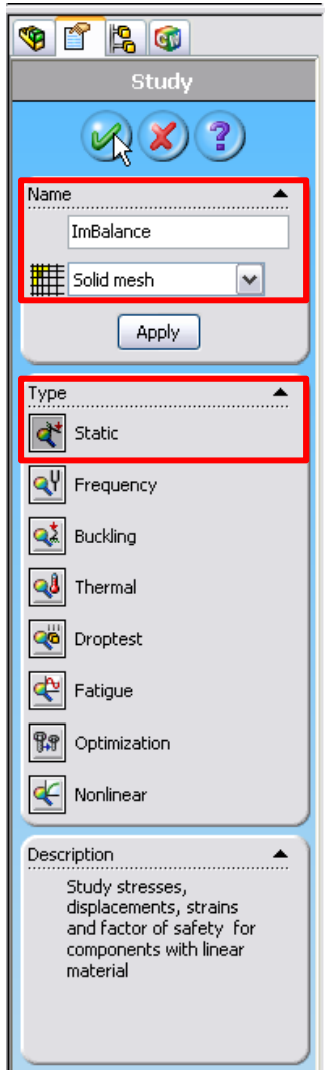
Imbalance.SLDASM

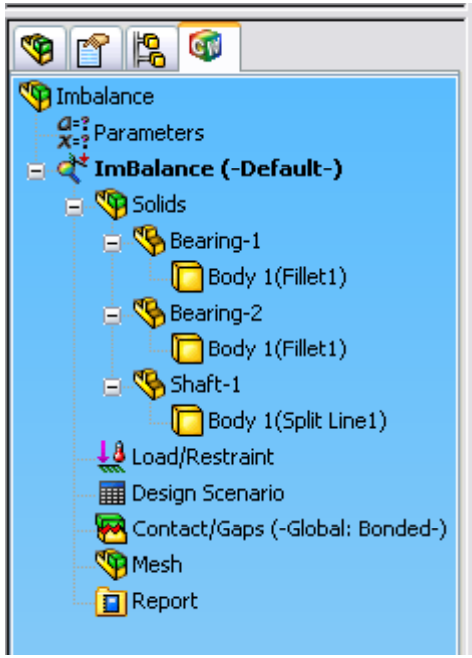


Create a Study

Study >> Solid Mesh & Static

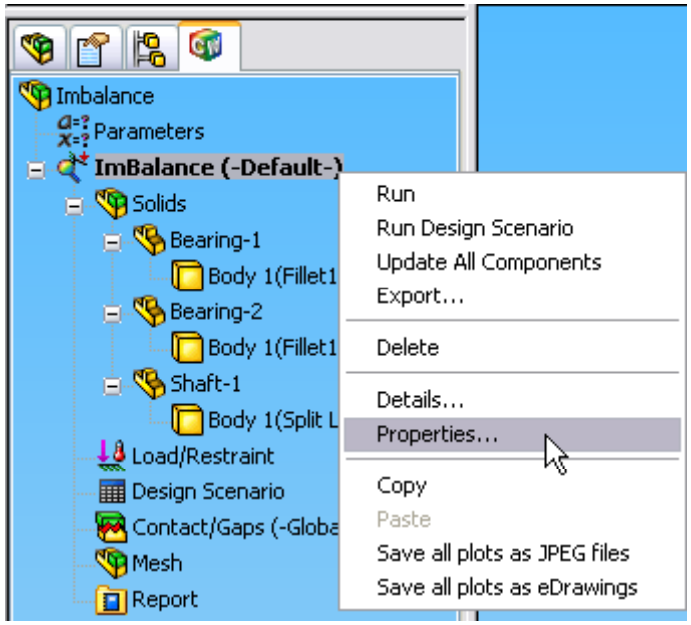


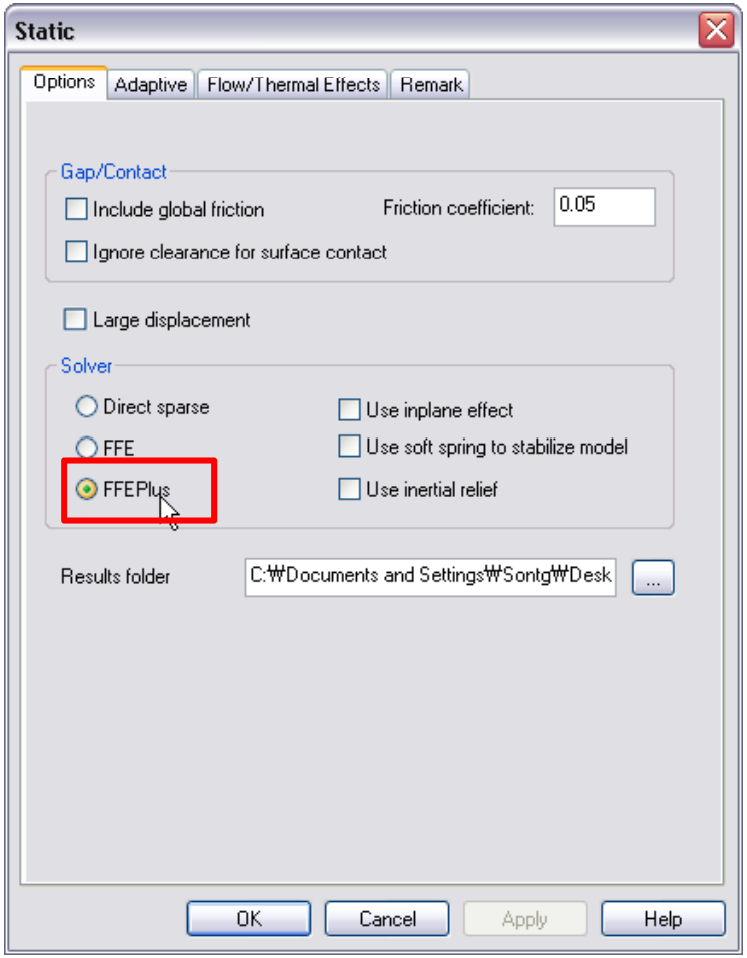




Properties

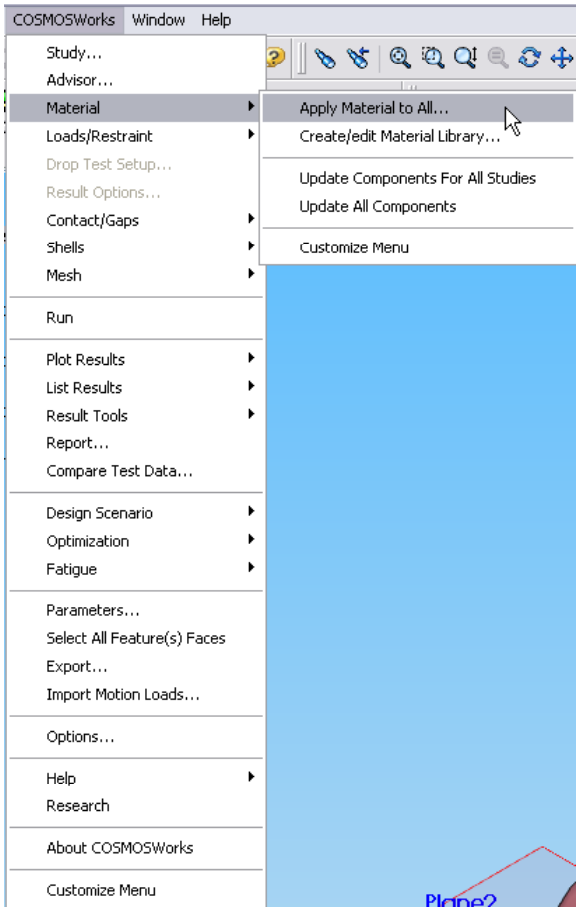
ImBalance >> Properties >> FFEPlus Solver

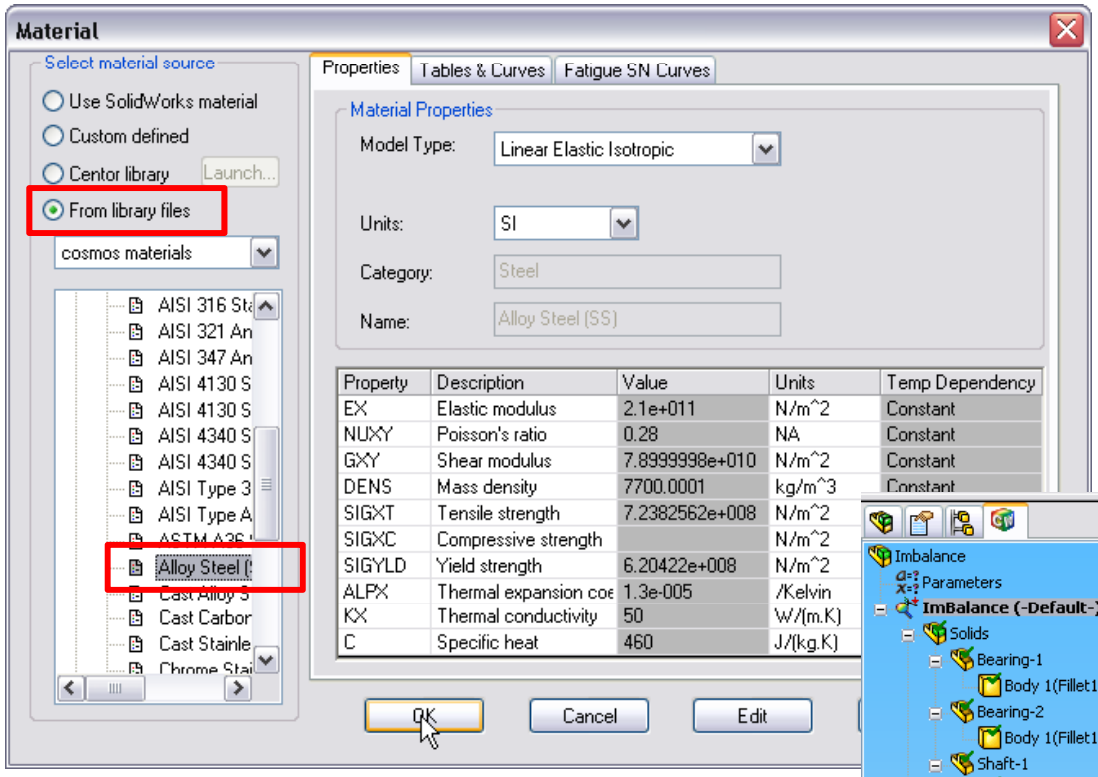


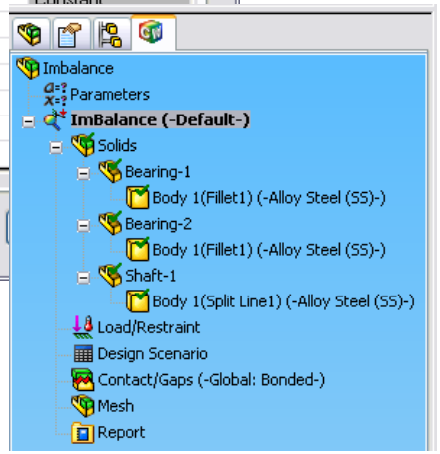


Define Materials

COSMOSWorks >> Material >> Apply Materials to All… >> Alloy Steel

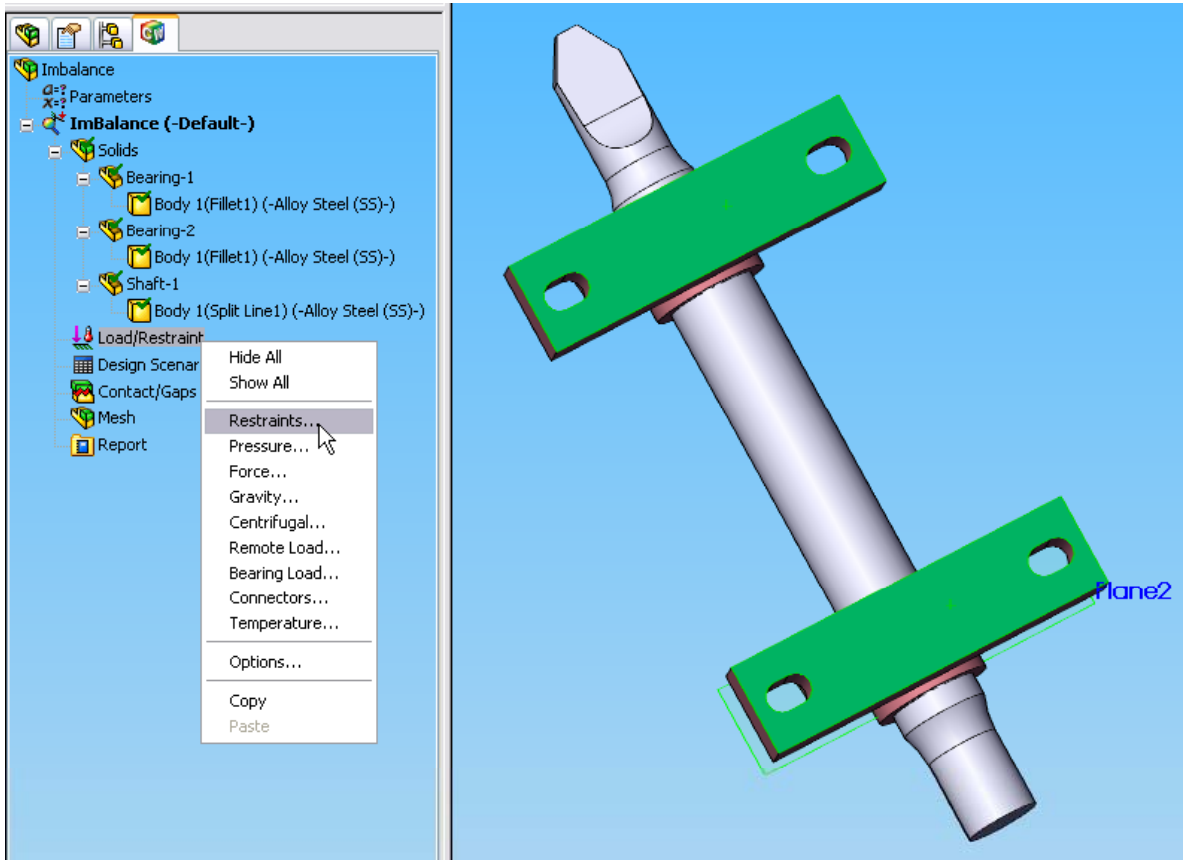


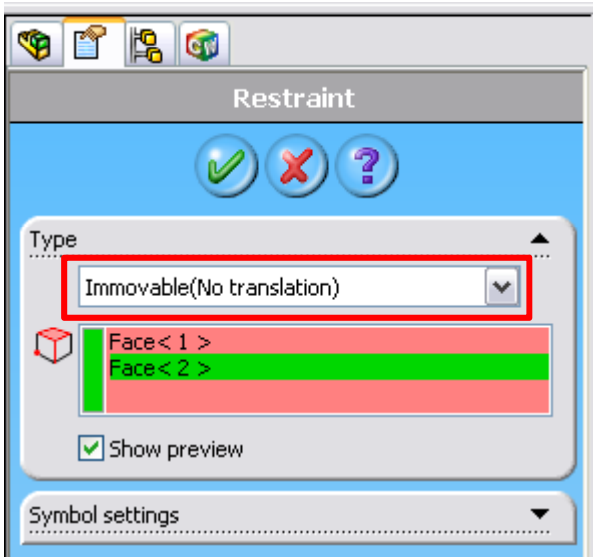




Restraint - Immovable

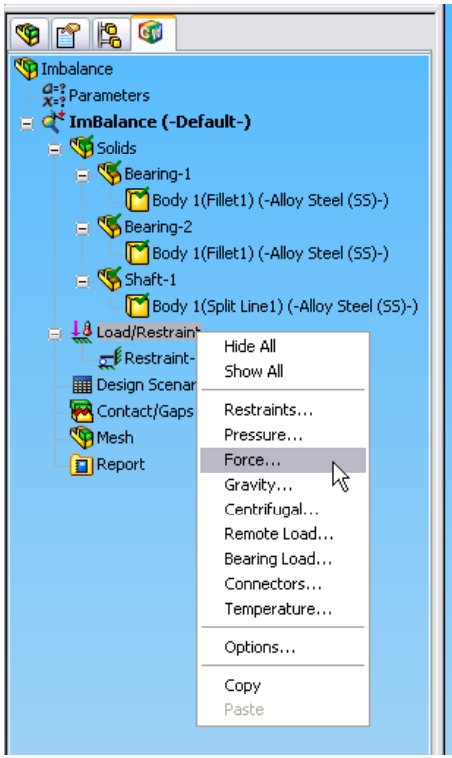
Load/Restraints >> Restraints >> Immovable

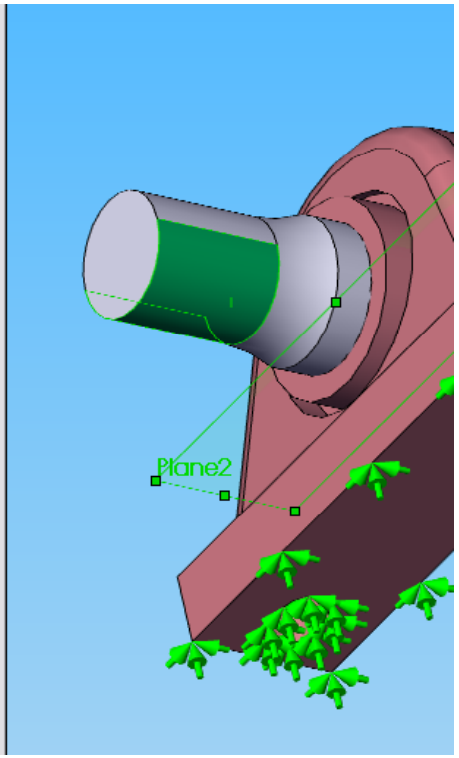


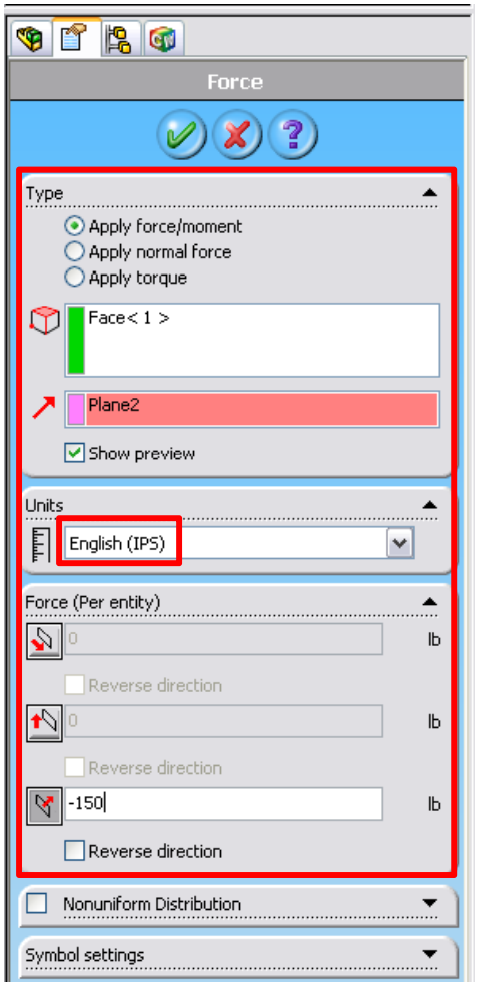


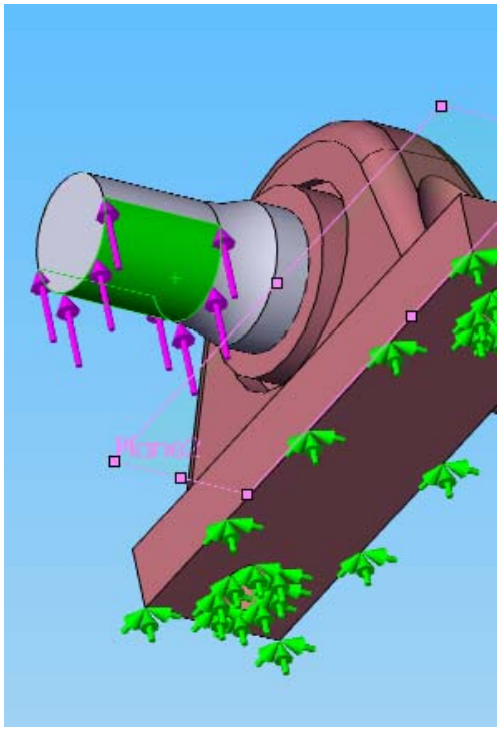
Force - Normal to Plane

Load/Restraints >> Force >> Normal to Plane >> - 150 lb



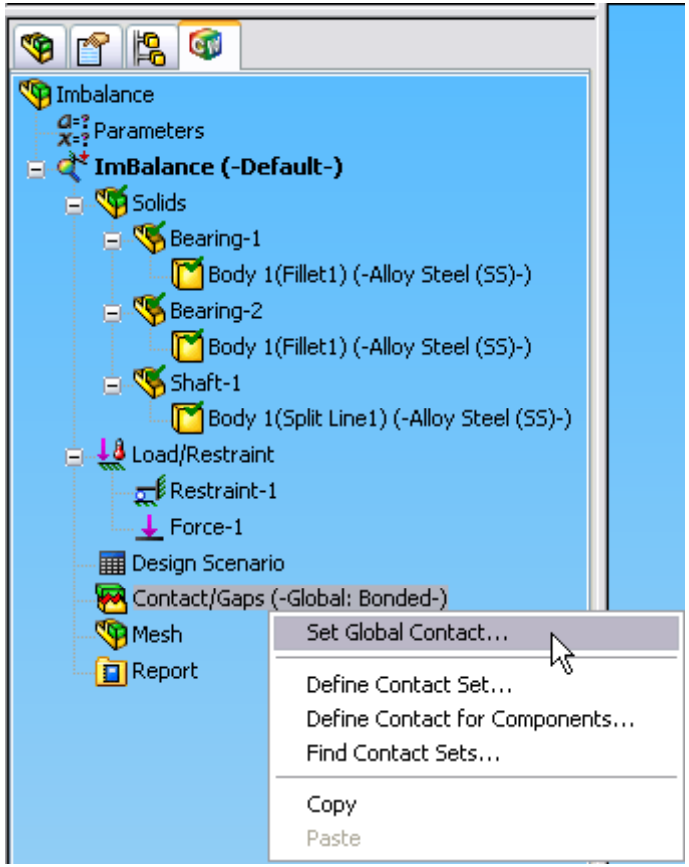


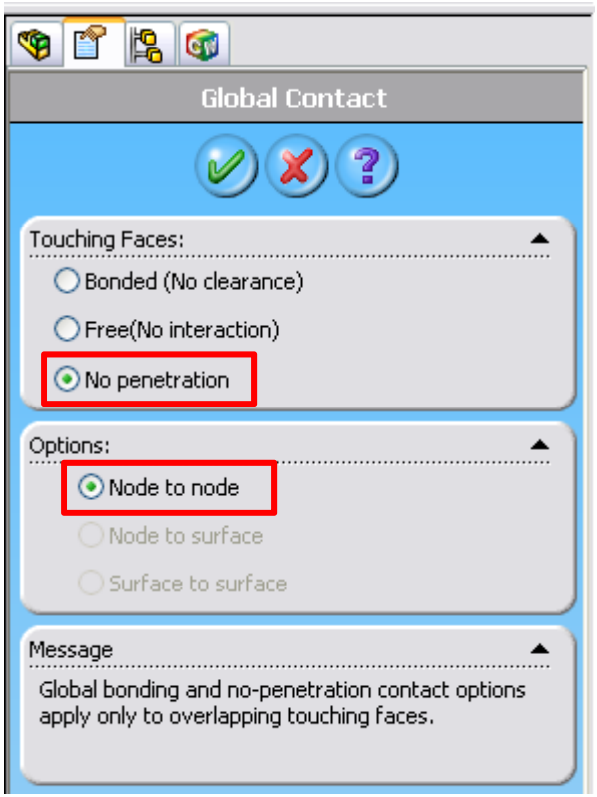




Contact/Gaps

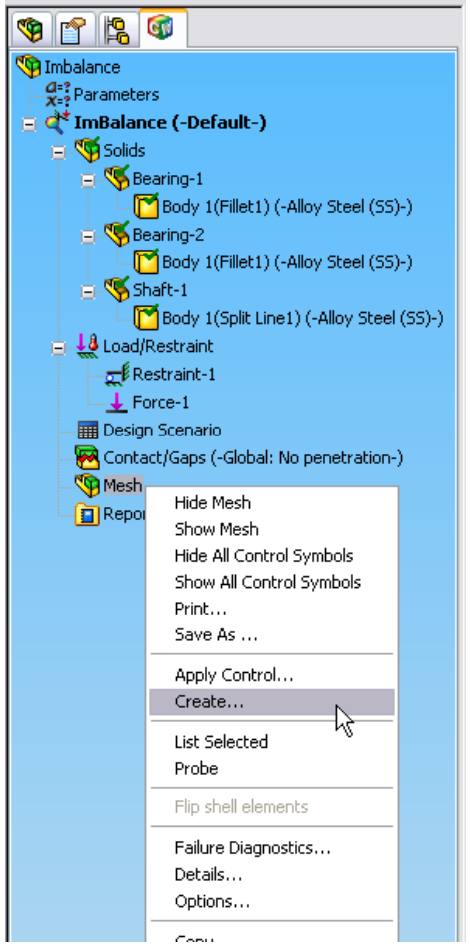
Contact/Gaps >> Set Global Contact >> No Penetration >> Node to Node

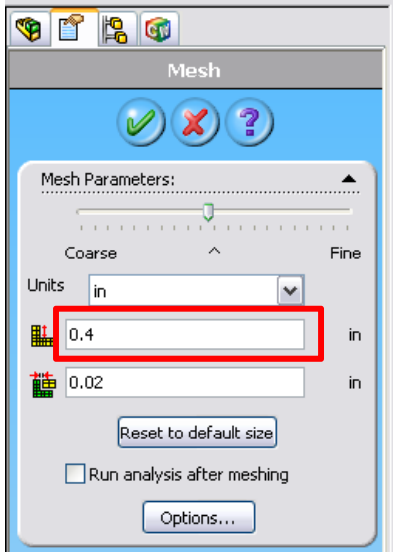


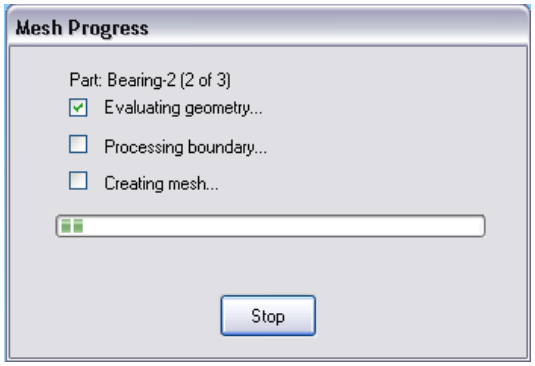


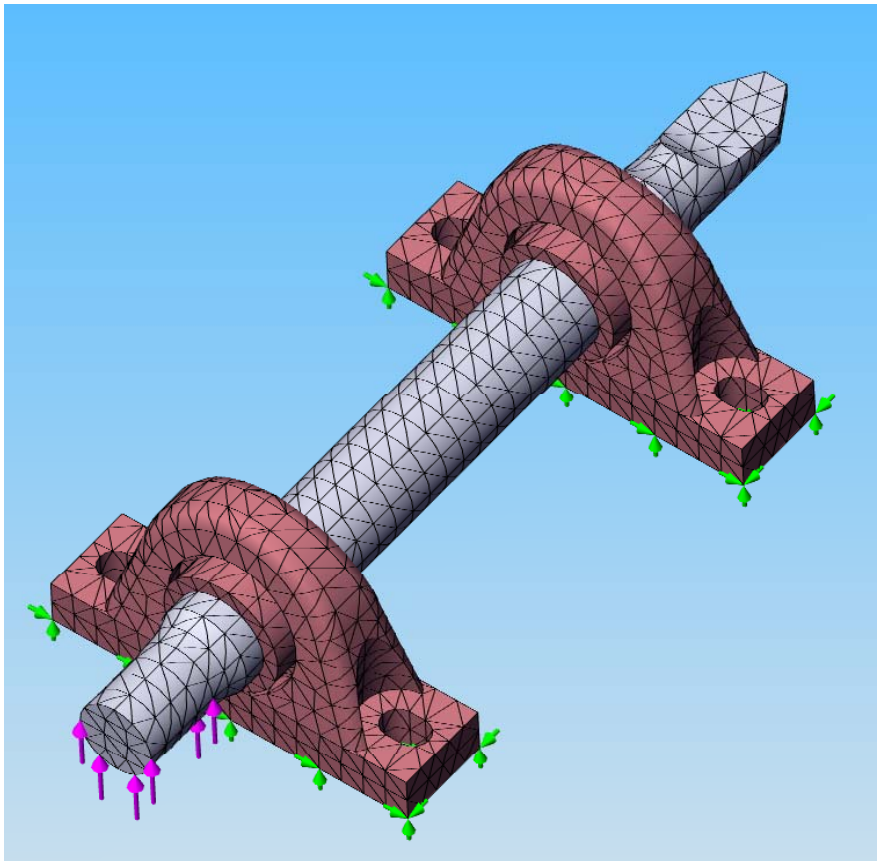
Create Mesh

Mesh >> Create >> 0.4 in



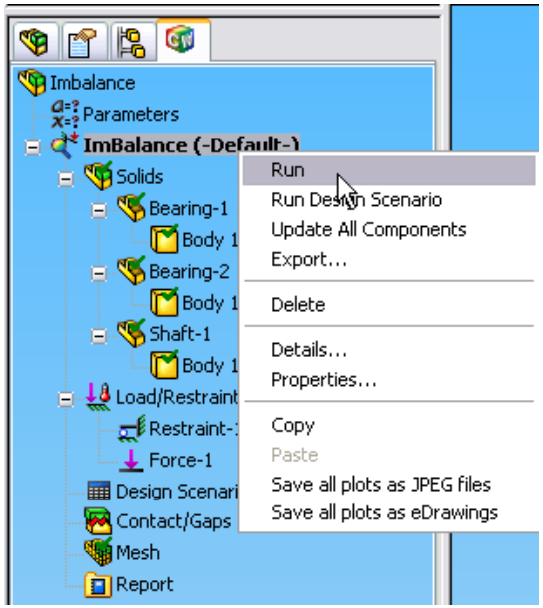


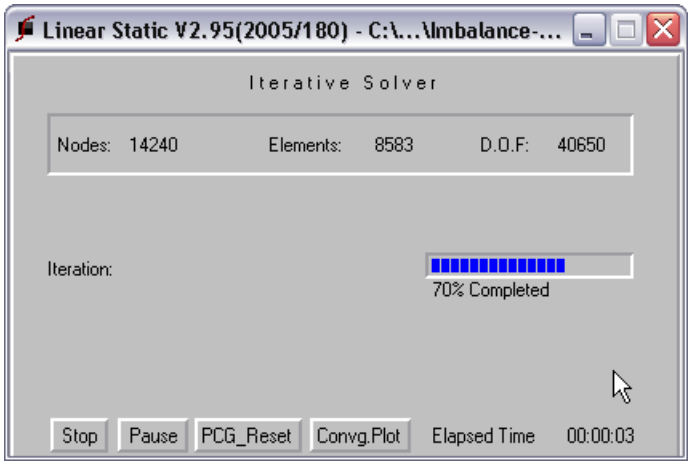


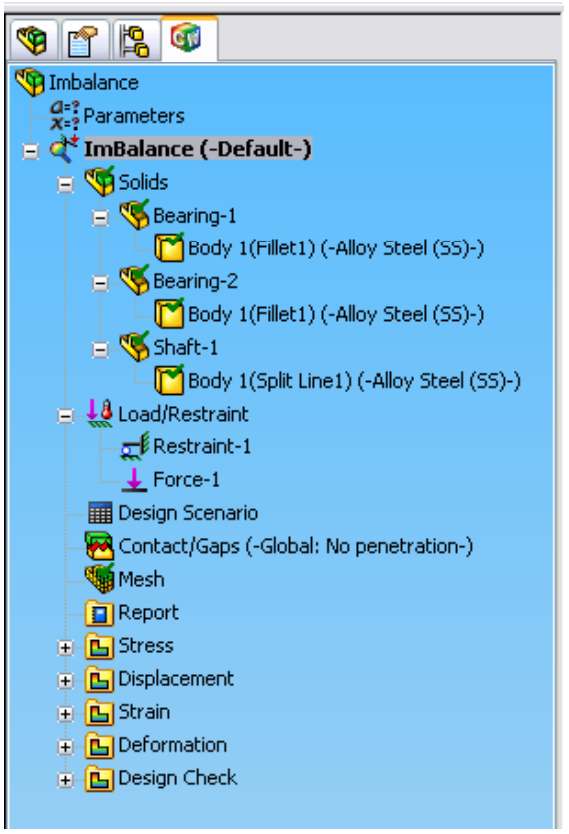


Run Static Analysis

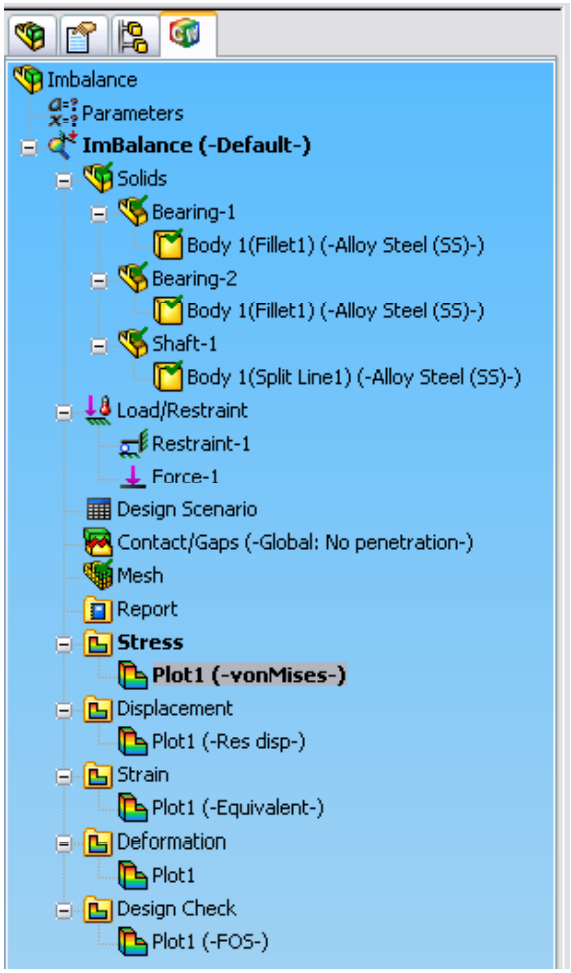
ImBalance >> Run

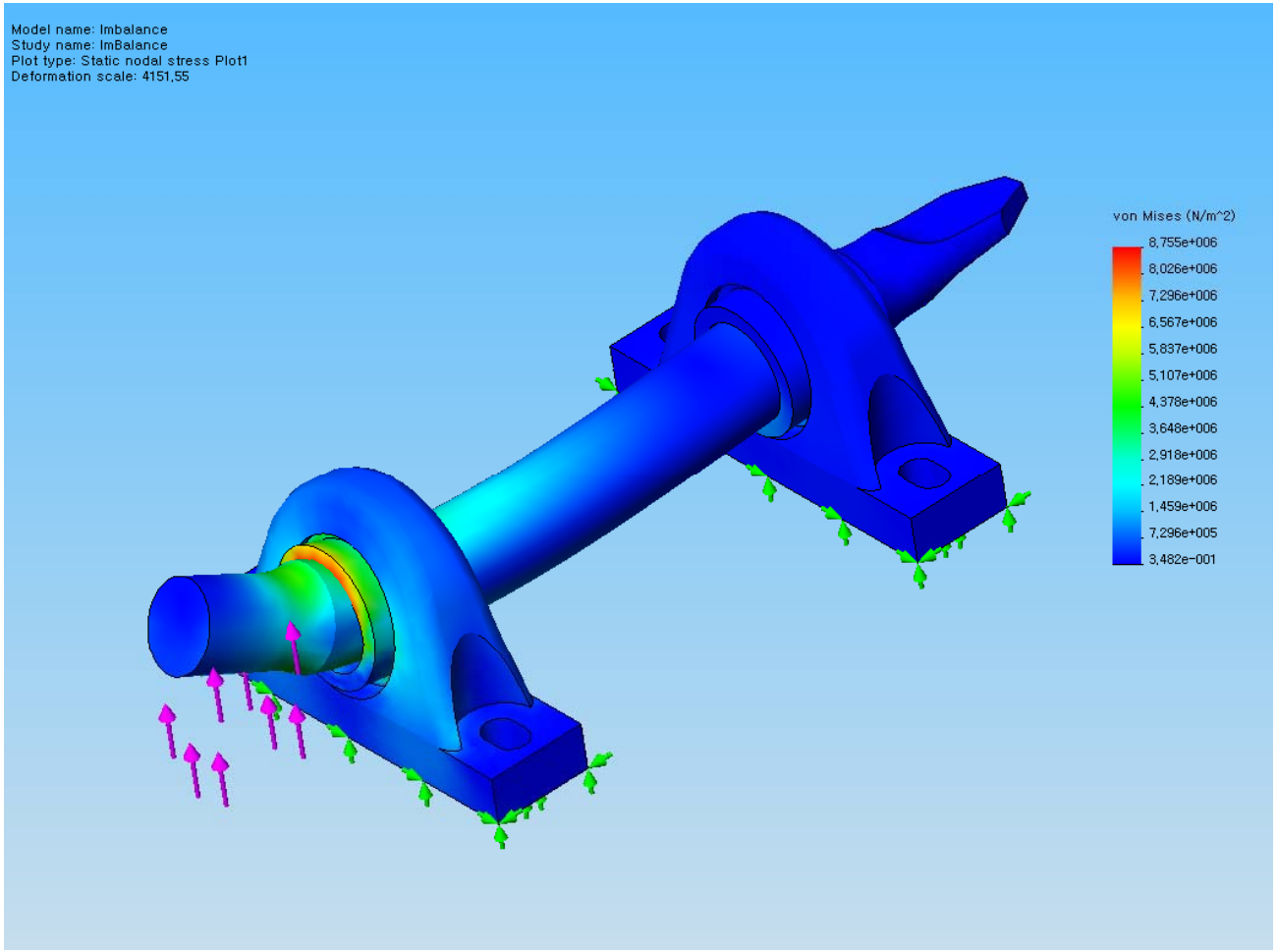






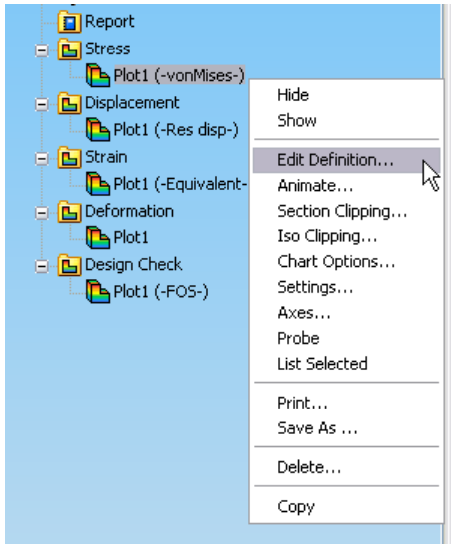
Stress Plot

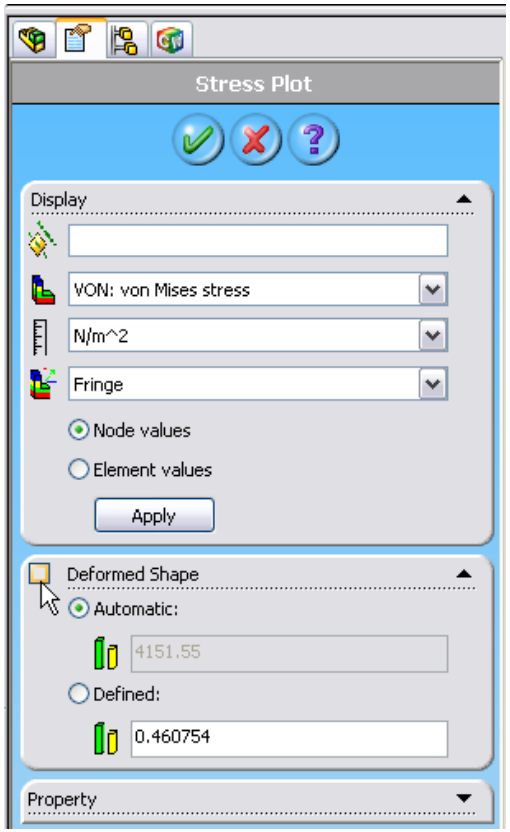

Imbalance
Parameters
ImBalance (-Default-)
Solids
Bearing-1
Body 1(Fillet1) (-Alloy Steel (SS)-)
Bearing-2
Body 1(Fillet1) (-Alloy Steel (SS)-)
Shaft-1
Body 1(Split Line1) (-Alloy Steel (SS)-)
Load/Restraint
Restraint-1
Force-1
Design Scenario
Contact/Gaps (-Global: No penetration-)
Mesh
Report
Stress
Plot1 (-vonMises-)
Displacement
Plot1 (-Res disp-)
Strain
Plot1 (-Equivalent-)
Deformation
Plot1
Design Check
Plot1 (-FOS-)

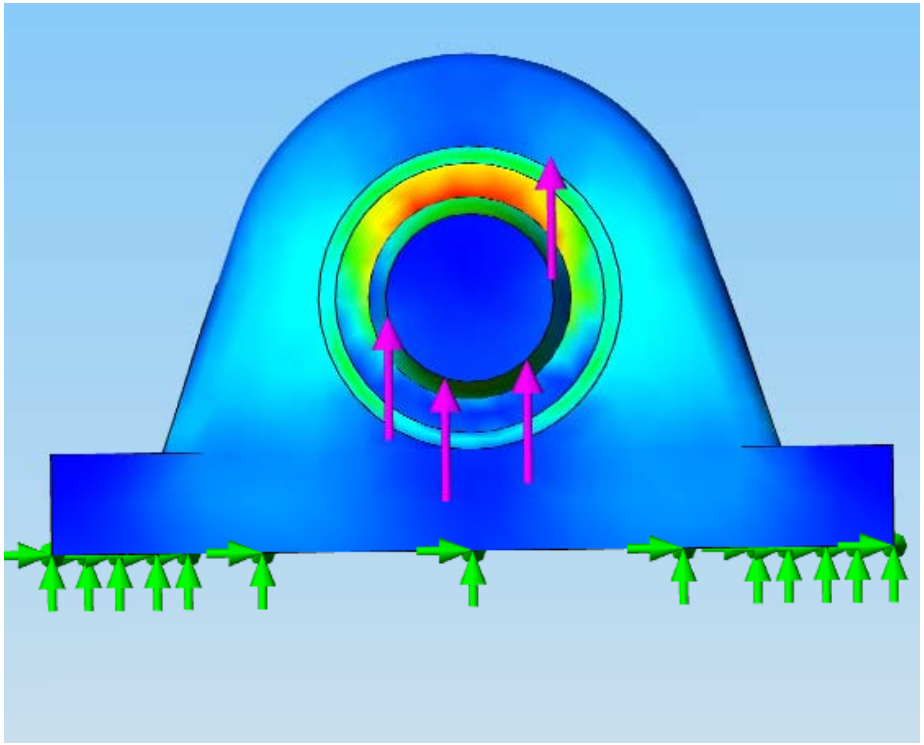

Model name: Imbalance
Study name: ImBalance
Plot type: Static nodal stress Plot1
Deformation scale: 4151,55
von Mises (N/m^2)
8,755e+006
8,026e+006
7,296e+006
6,567e+006
5,837e+006
5,107e+006
4,378e+006
3,648e+006
2,918e+006
2,189e+006
1,459e+006
7,296e+005
3,482e-001

Deformed Shape

Stress Plot >> Edit Definition >> No Scale Factor

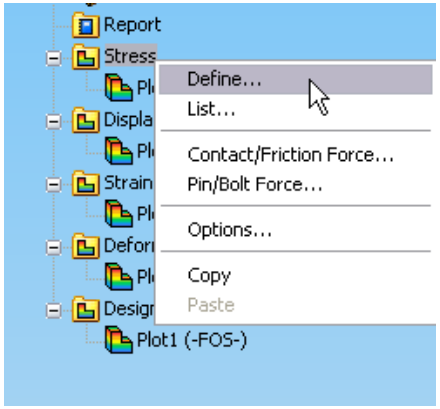


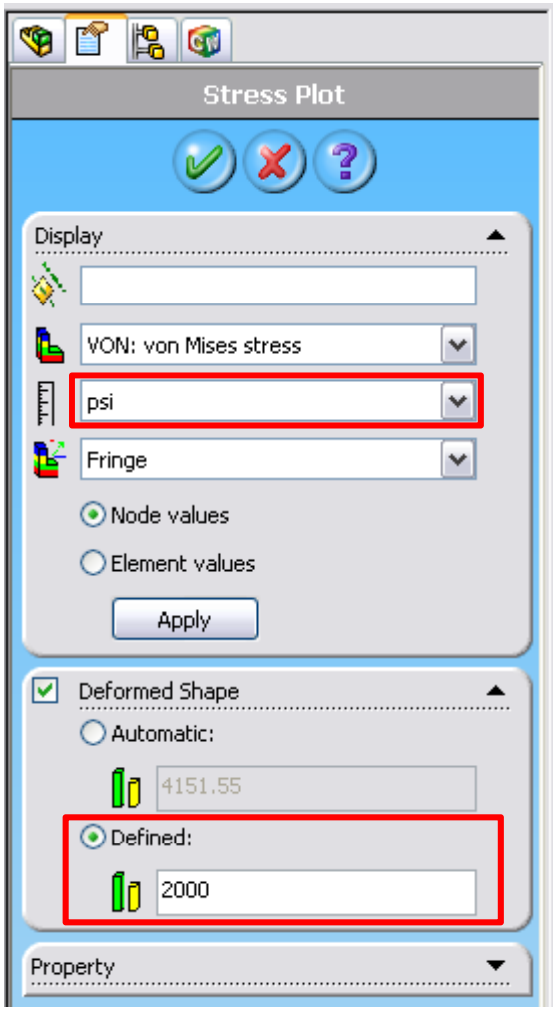


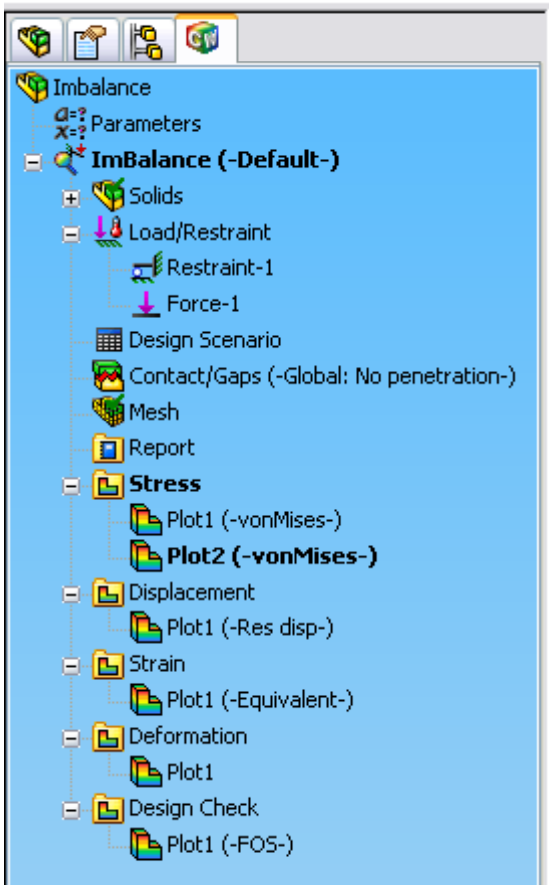


Create New Plot

Stress >> Define

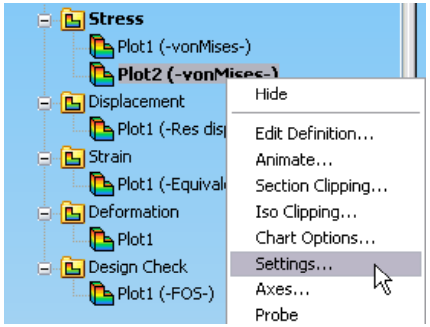


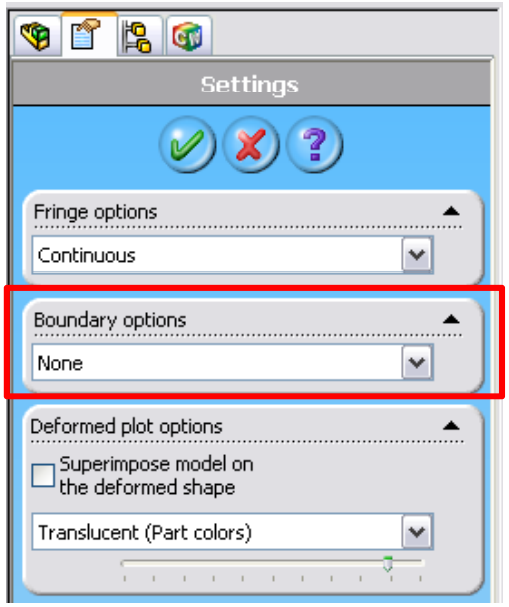




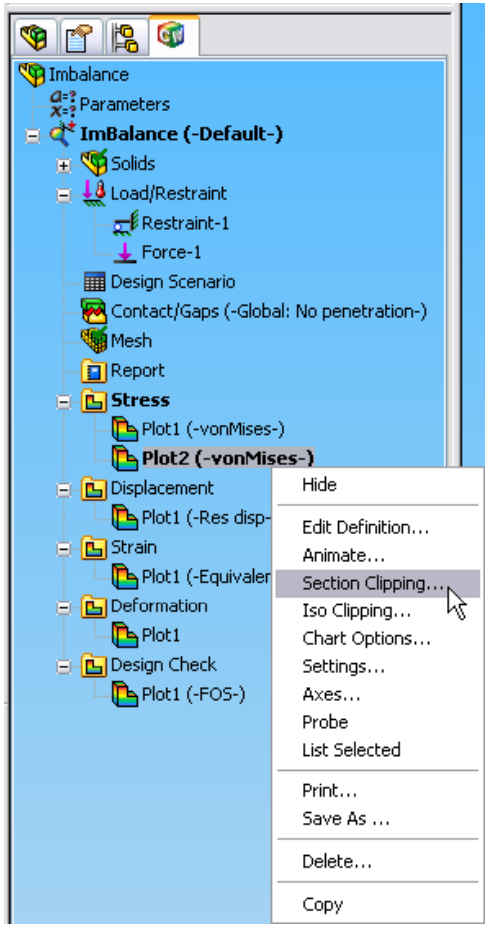
Plot Setting

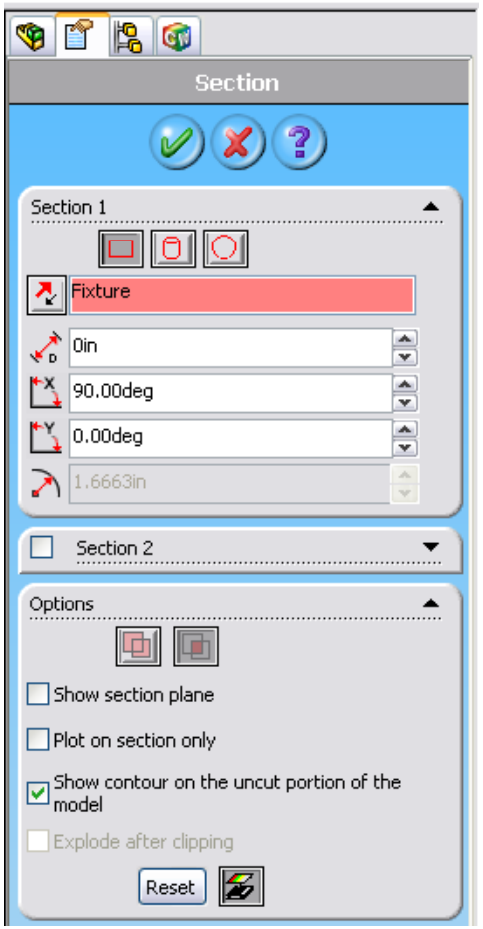
Setting >> No Boundary



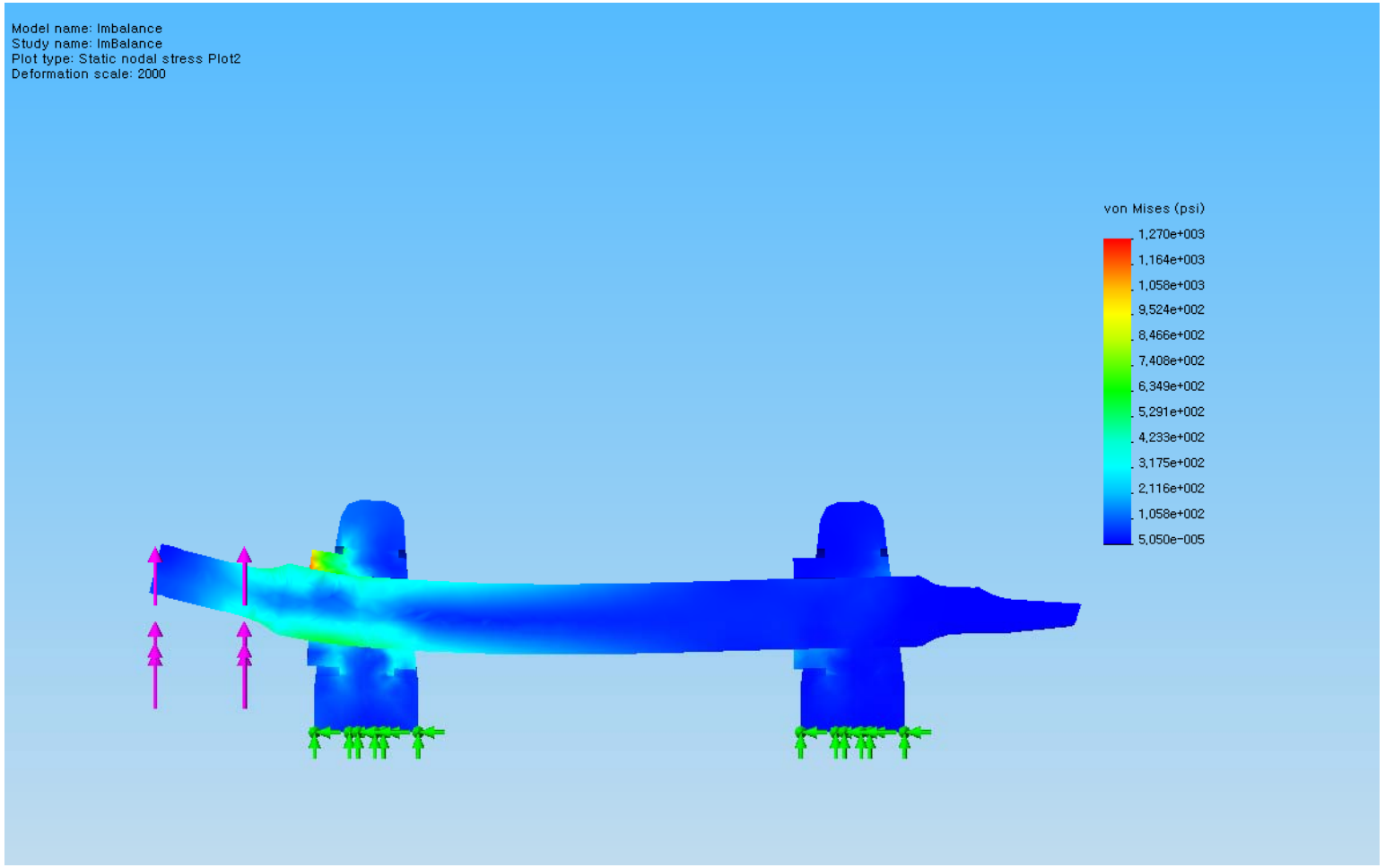


Section Clipping





Section View



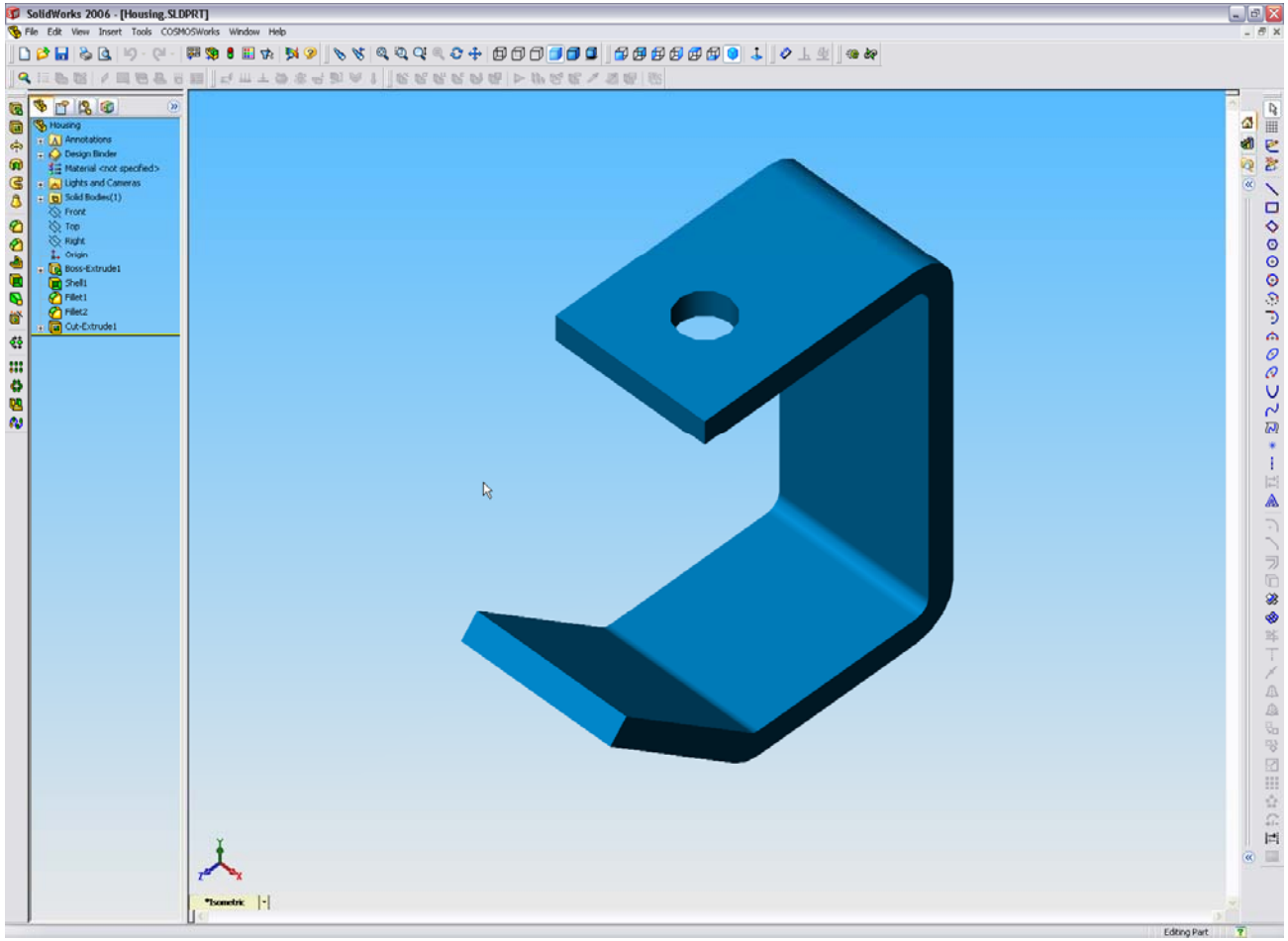
Buckling Analysis

Procedure

- Create a buckling analysis study
- Assign material to the part
- Insert restraints and pressure loading
- Mesh the part
- Run buckling analysis
- Visualize the buckling analysis results by listing critical factors and plotting buckling modes
- Remesh the part with mesh controls, rerun the analysis, and compare the results

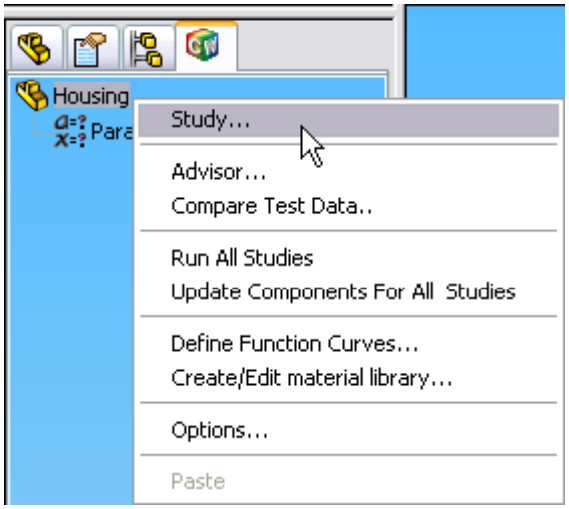
Open

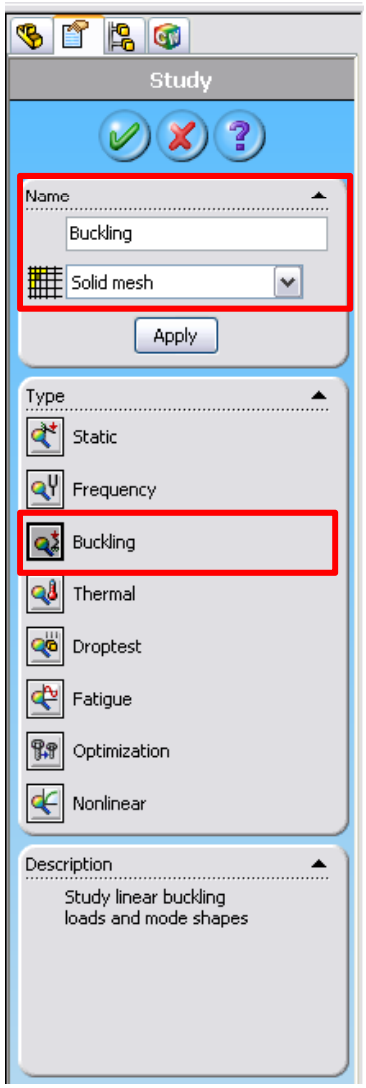
Housing.SLDPRT

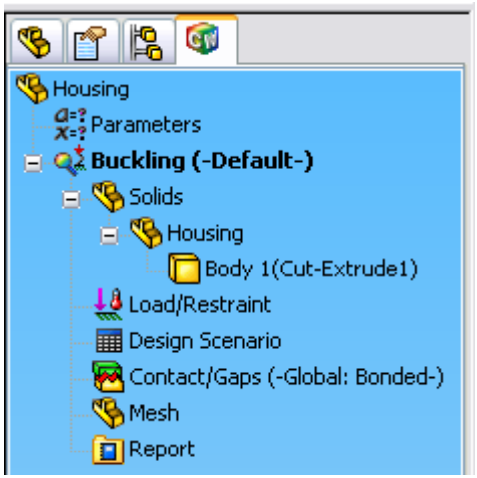


Create a Study

Study >> Solid Mesh & Buckling

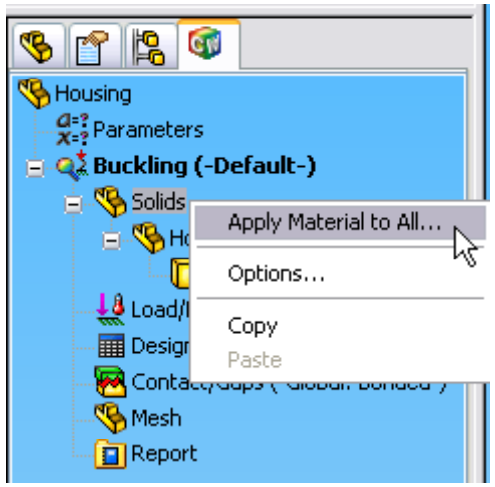


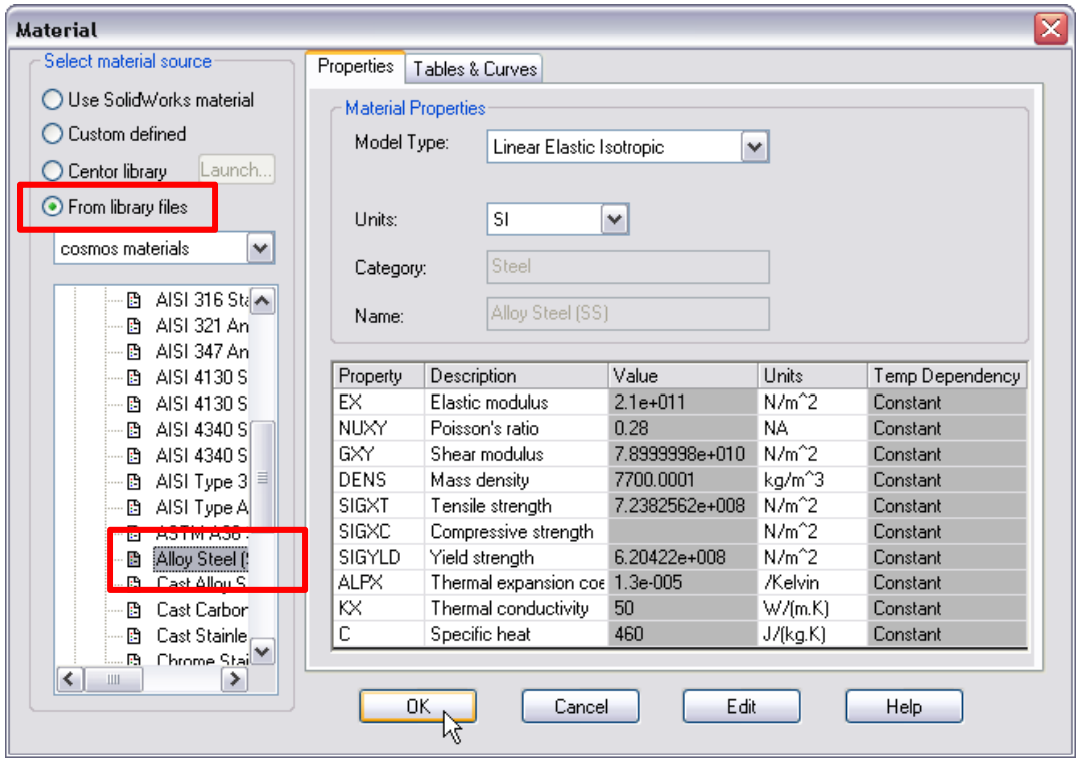




Define Material

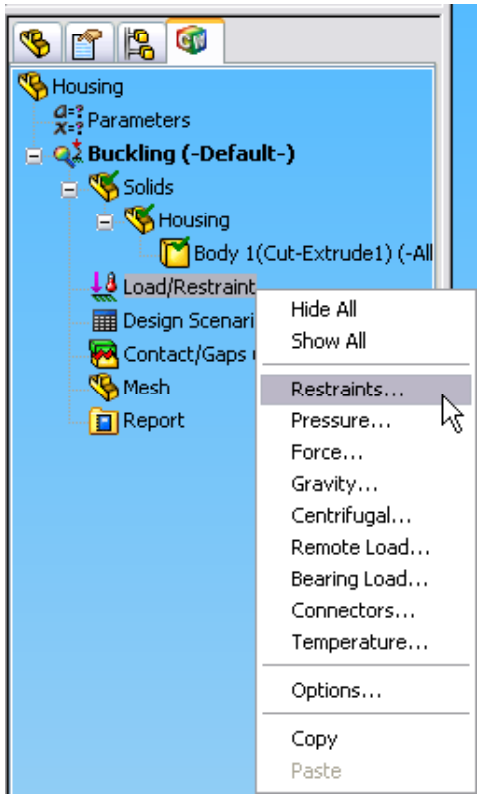
Solid >> Apply Material to All… >> Alloy Steel

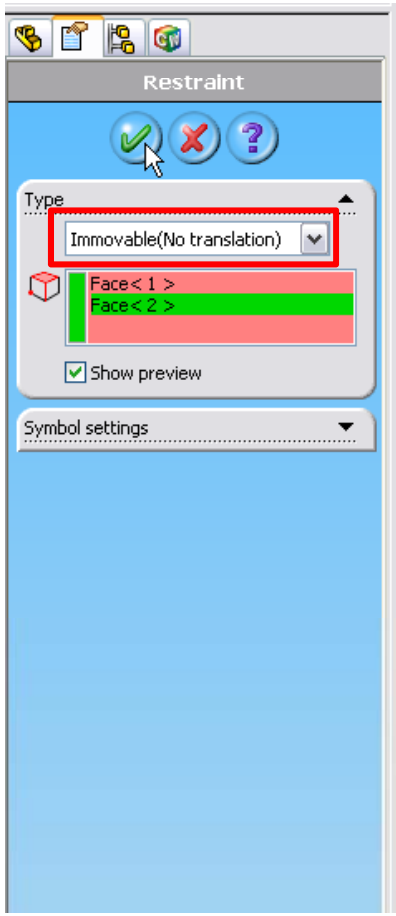


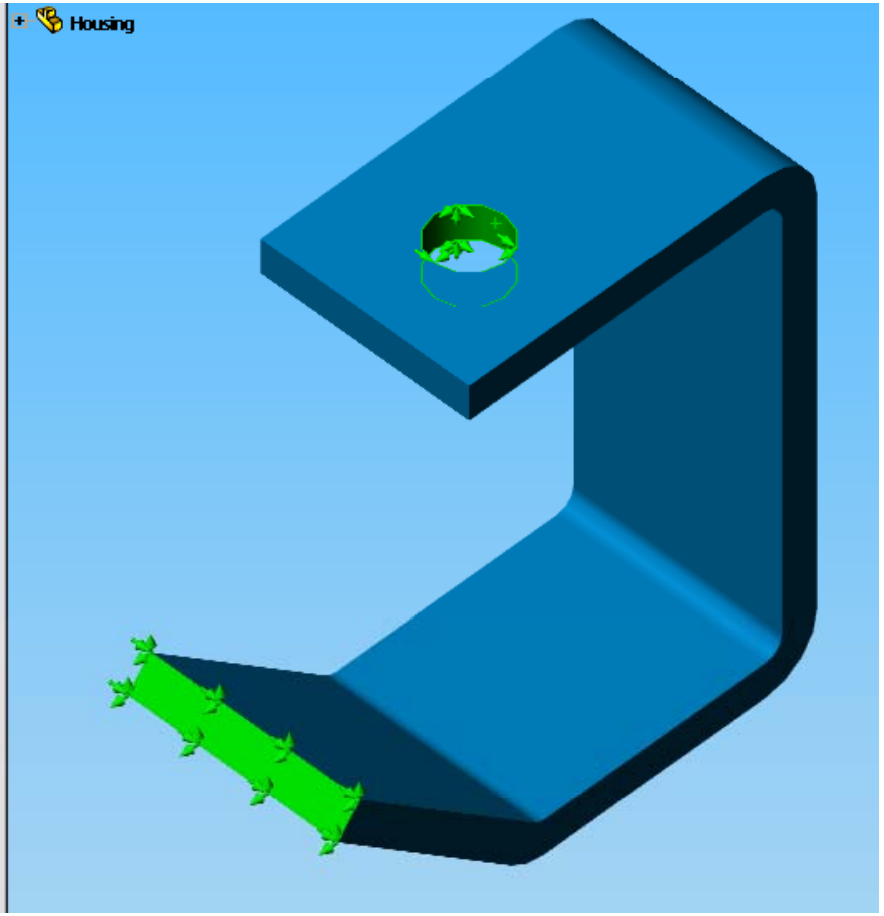


Restraints

Load/Restraints >> Restraints >> Immovable

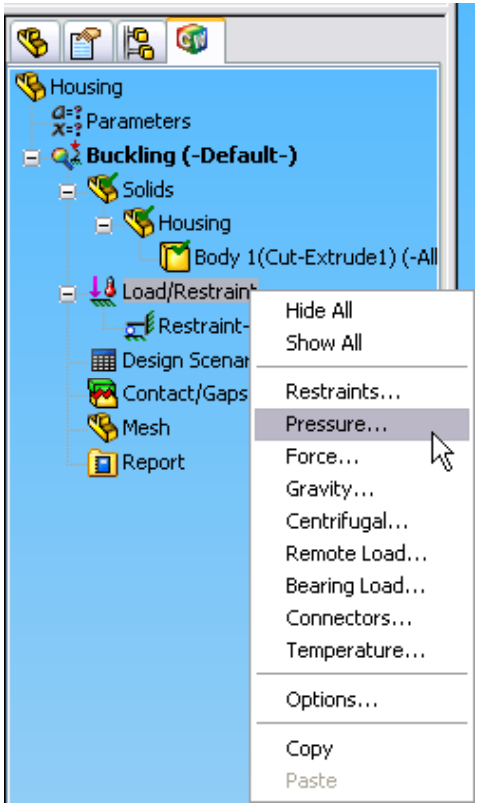


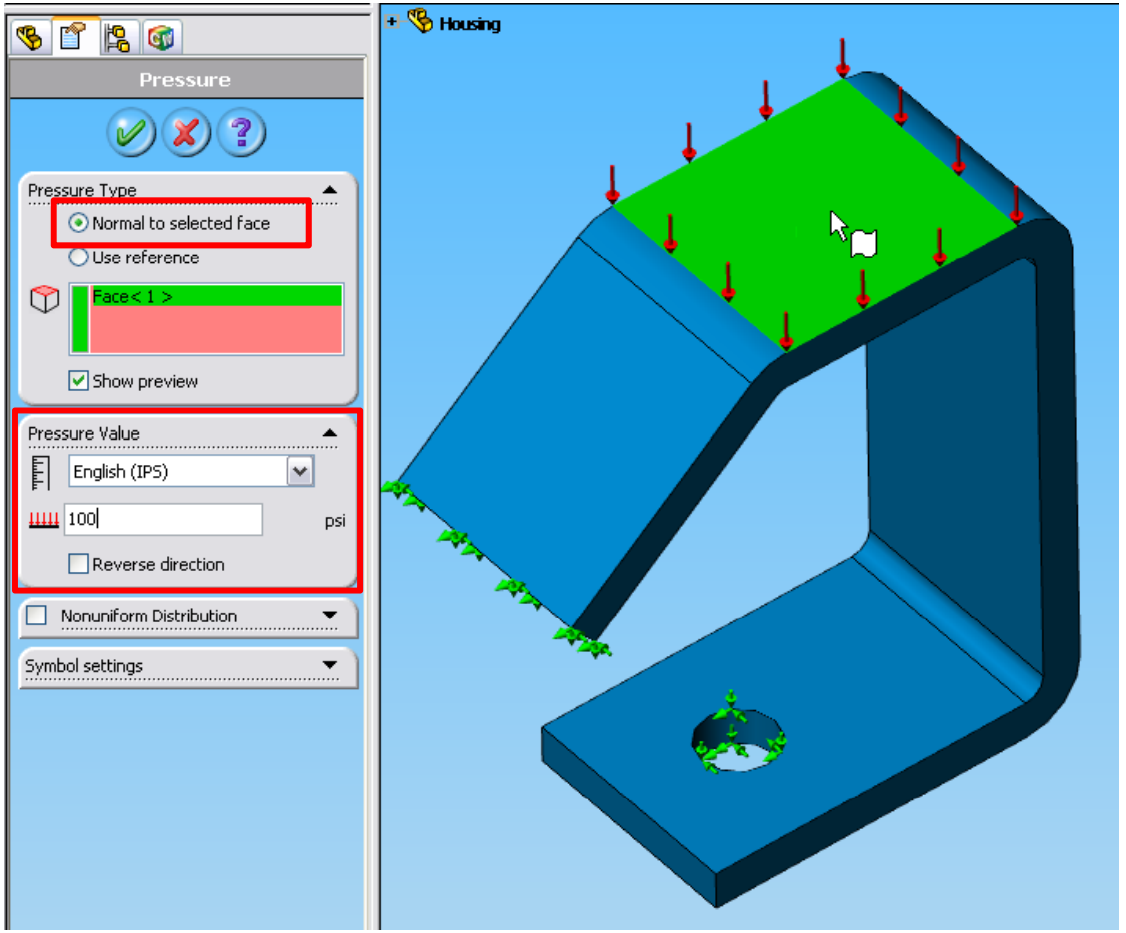




Pressure

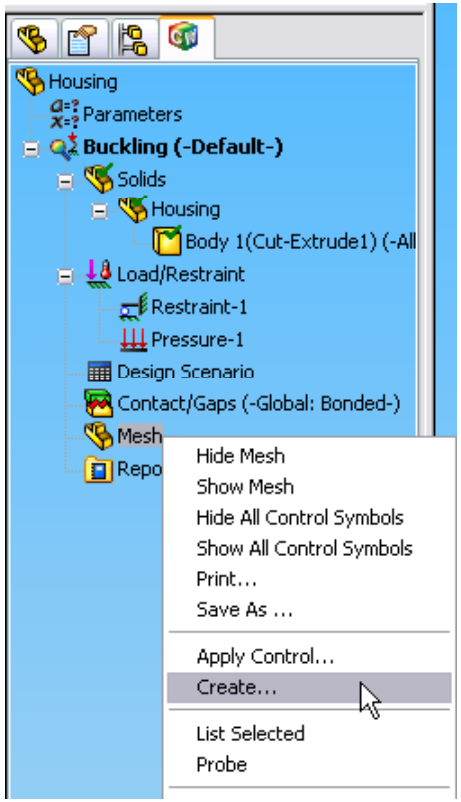
Load/Restraints >> Pressure >> Normal to -100 psi

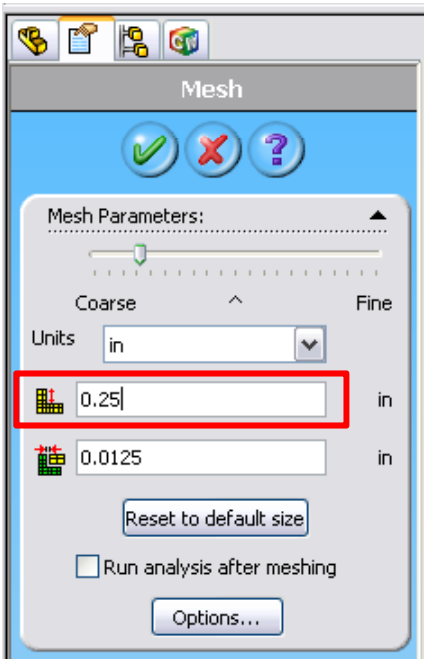


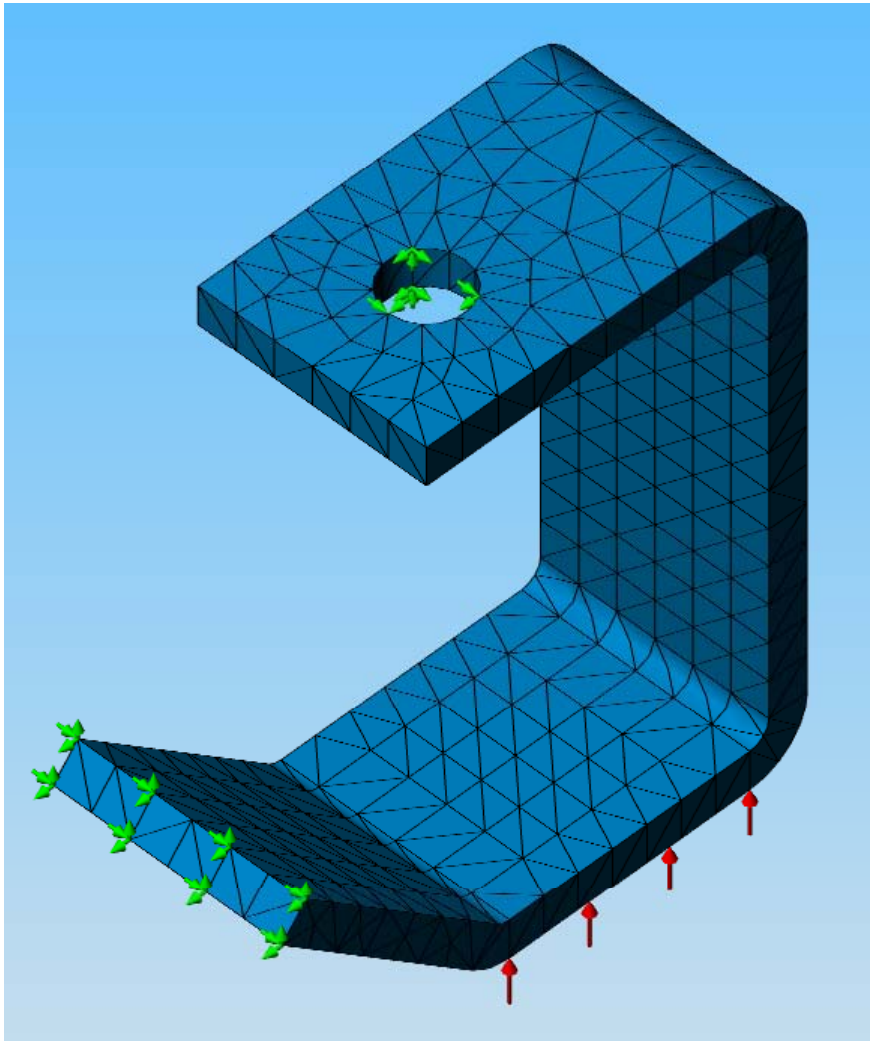


Create Mesh

Mesh >> Create >> 0.25 in

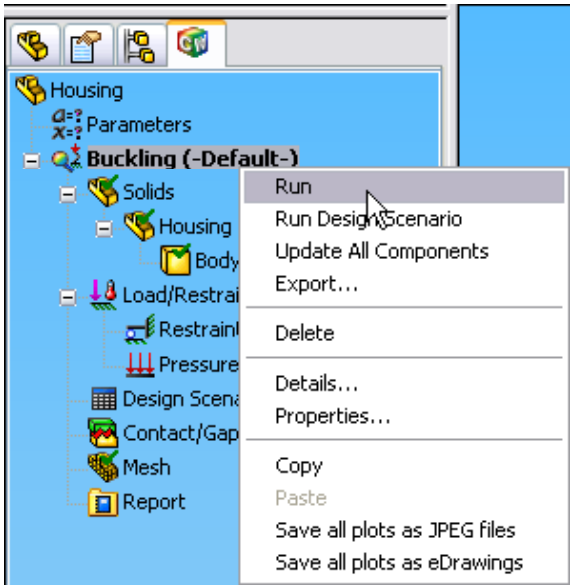


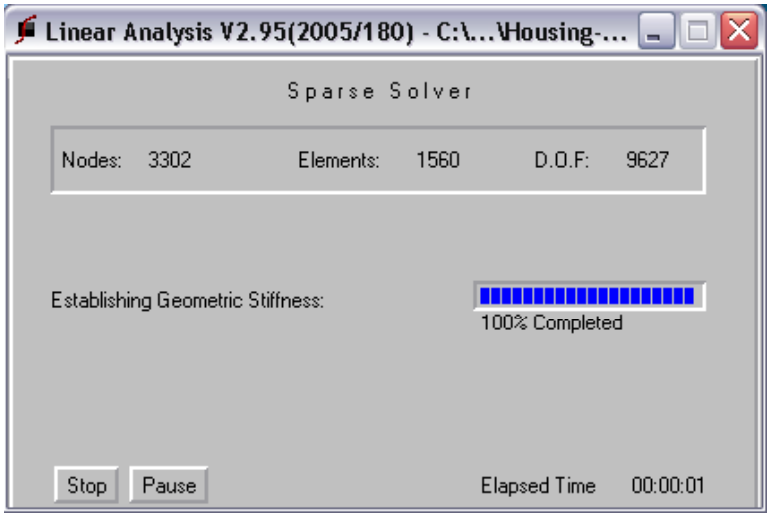


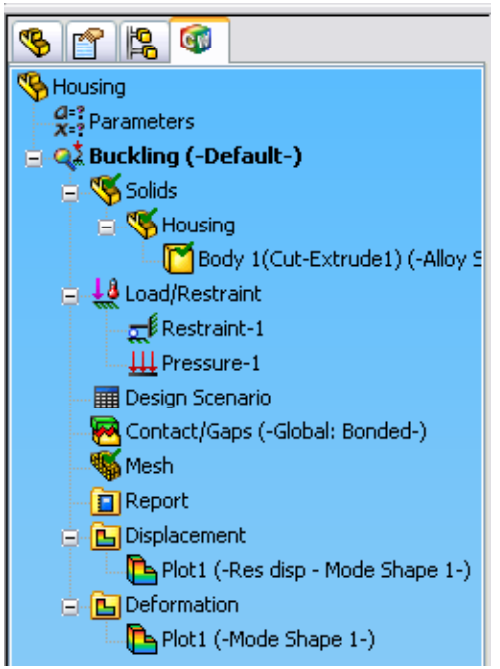


Run Buckling Analysis

Buckling >> Run

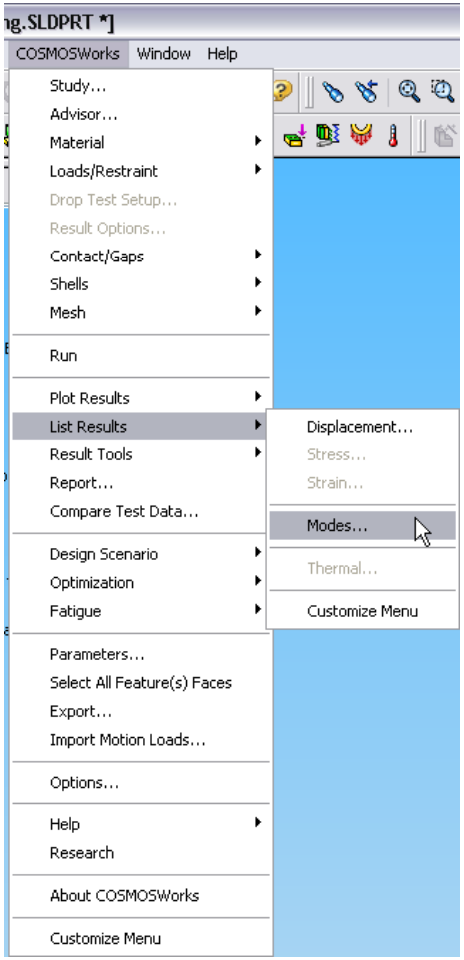


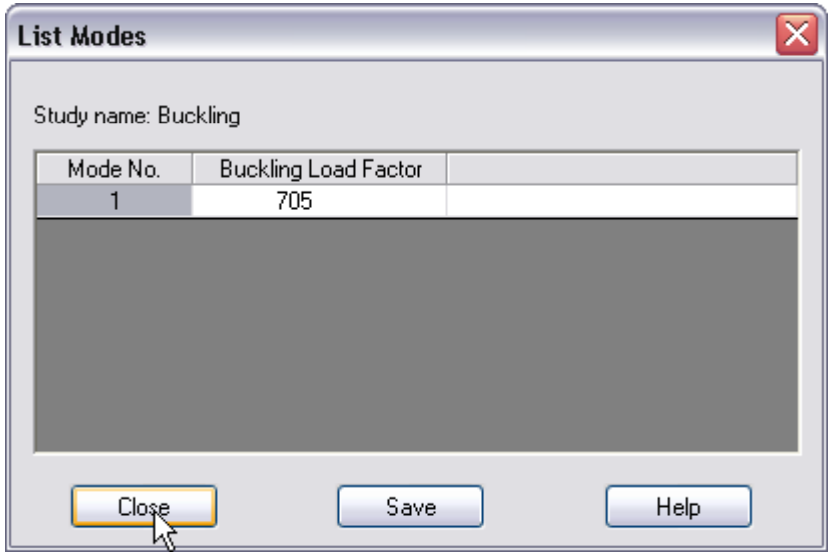




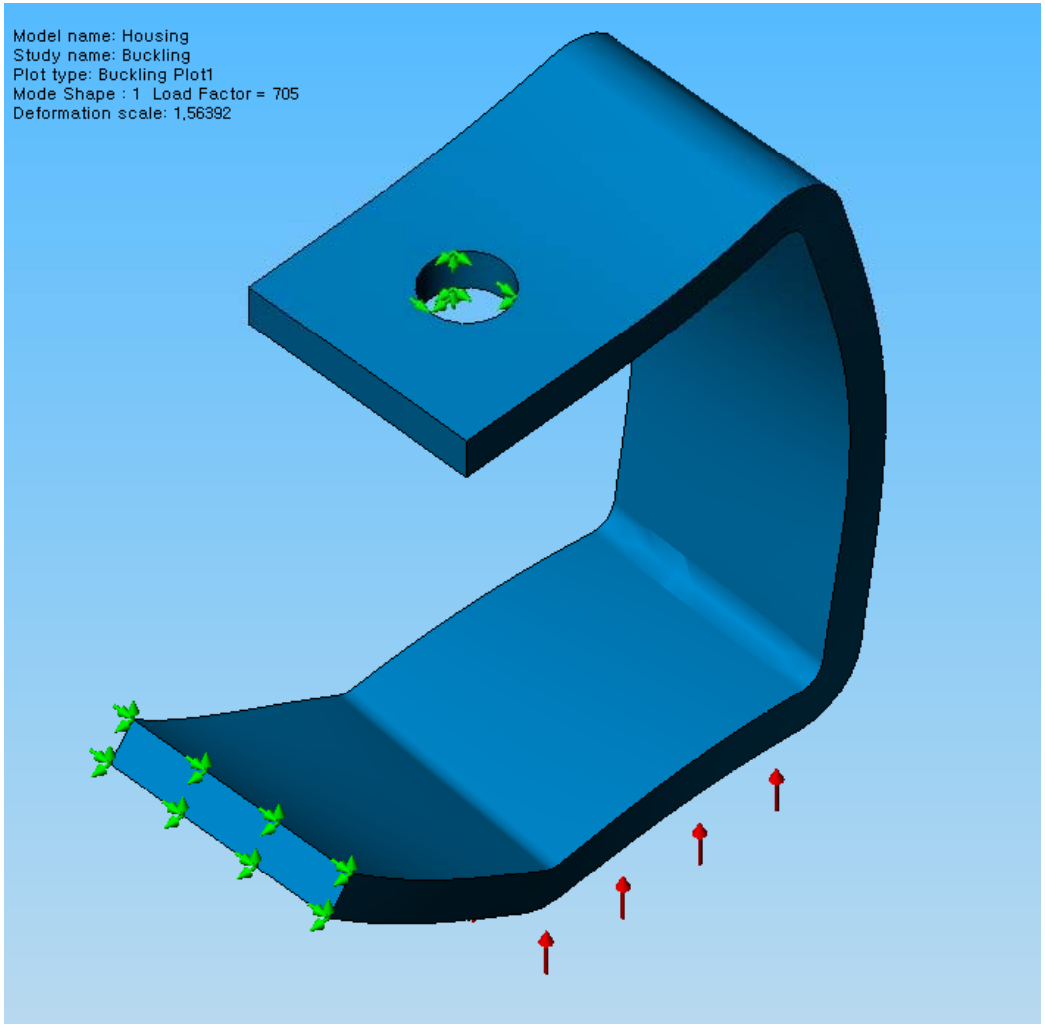
List Result - Mode Shape

COSMOSWorks >> List Result >> Modes





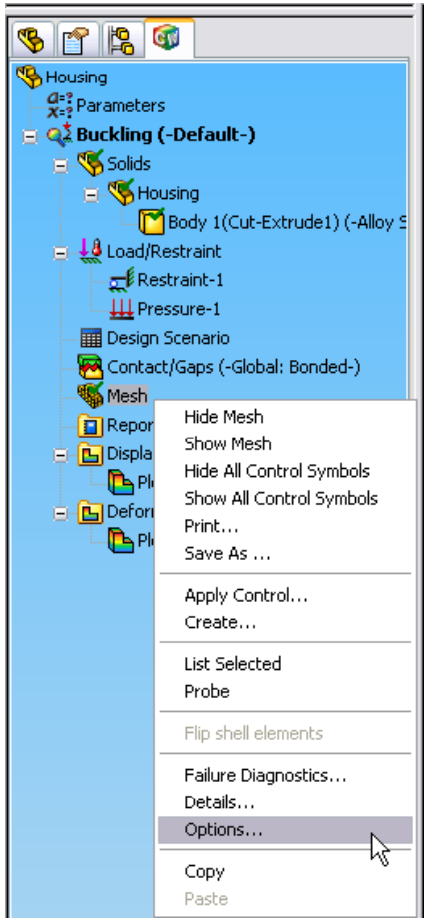
Deformation Plot

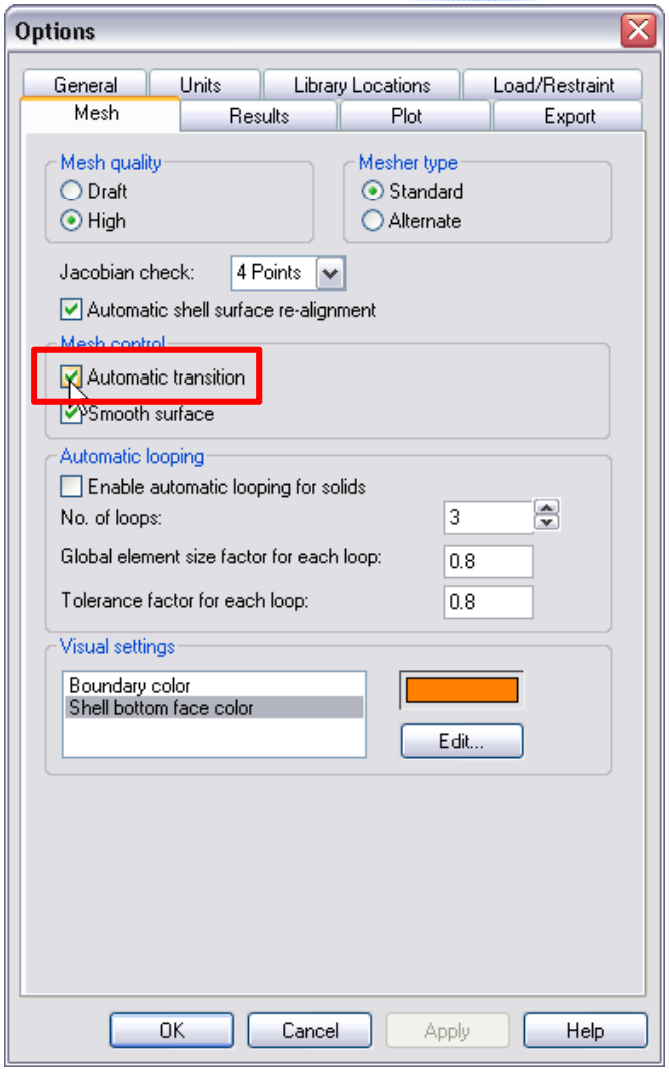


Critical Load Factor = 705
Critical Buckling Load = 70,500 psi
(Pressure * Critical Load Factor)

Mesh Control

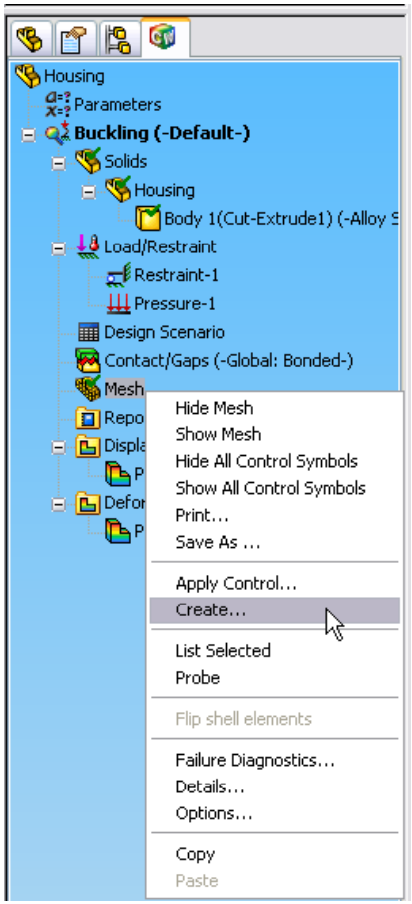
Mesh >> Options >> Automatic transition

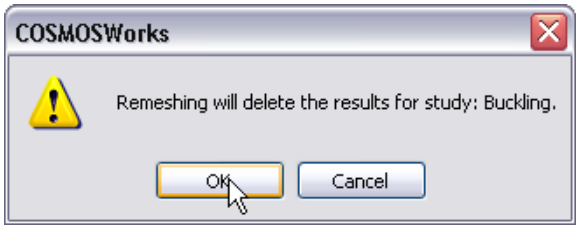


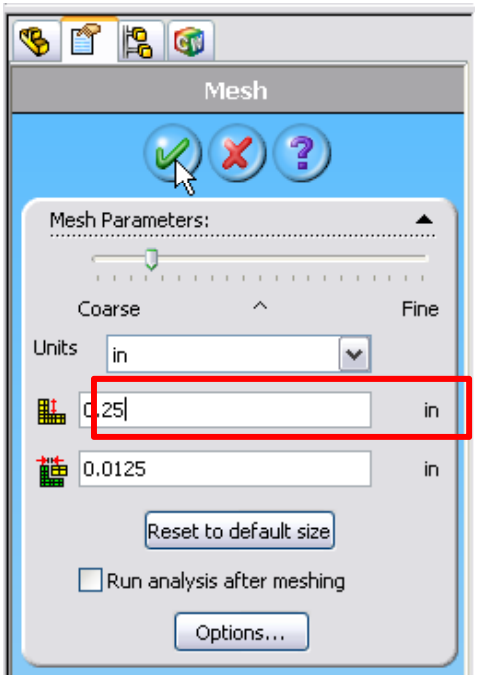


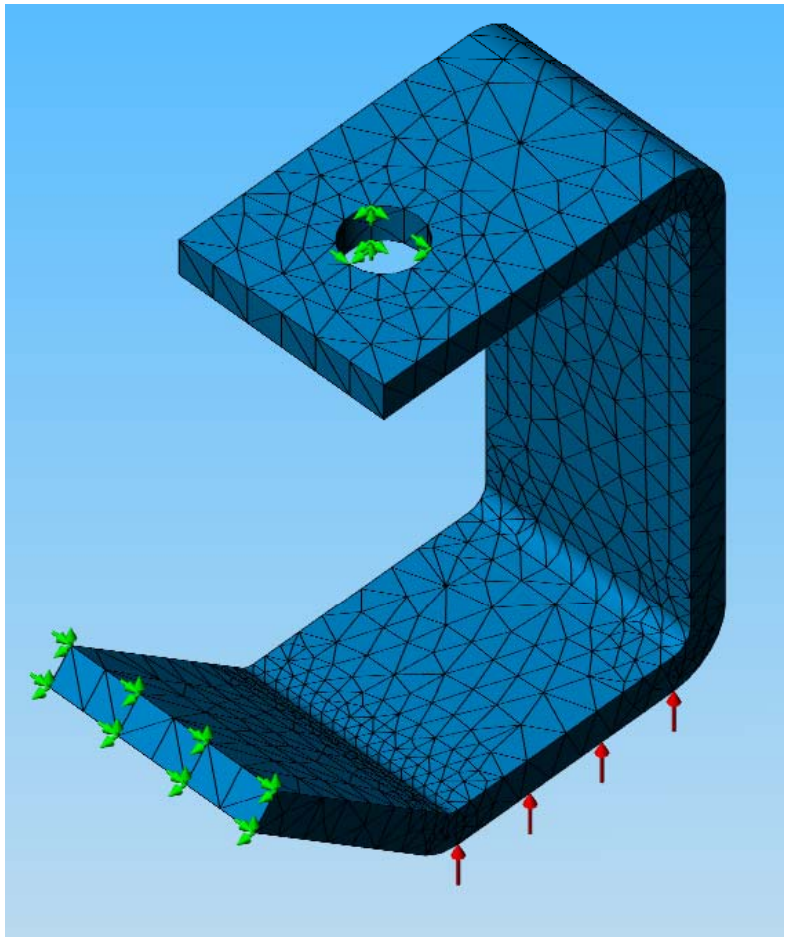
Remesh

Mesh >> Create >> 0.25 in



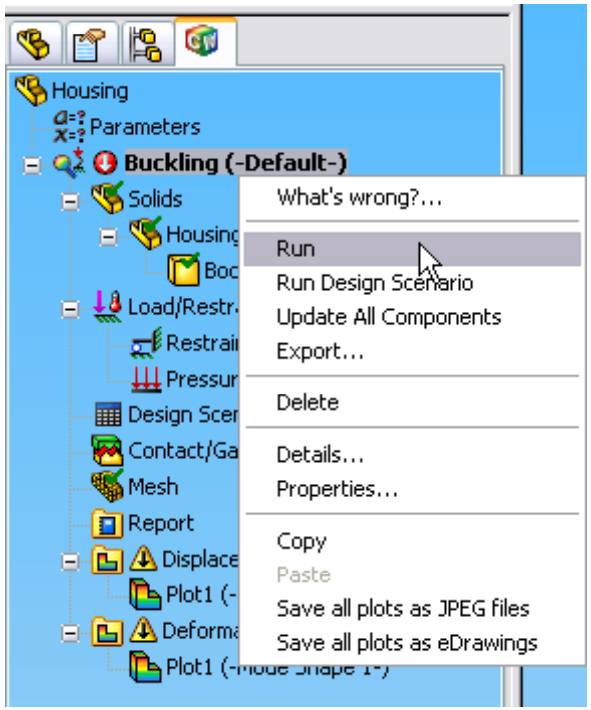


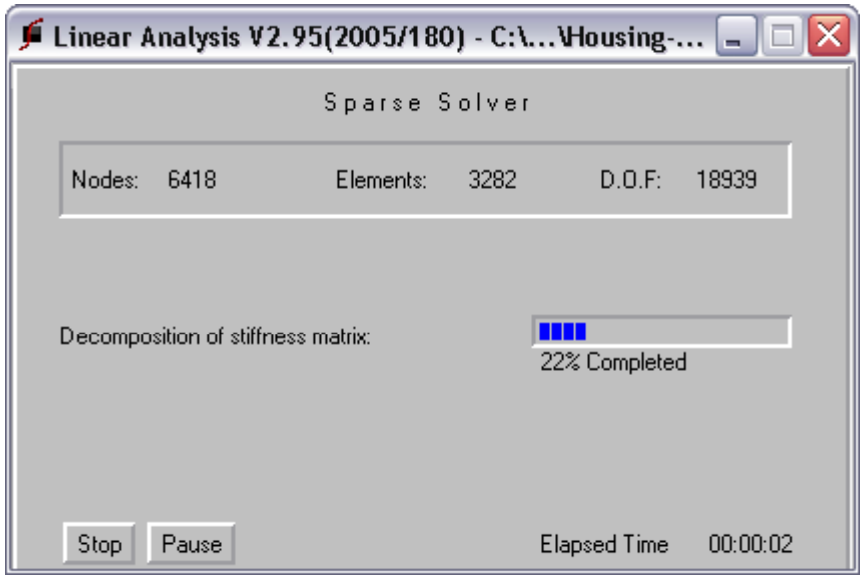




Rerun Buckling Analysis

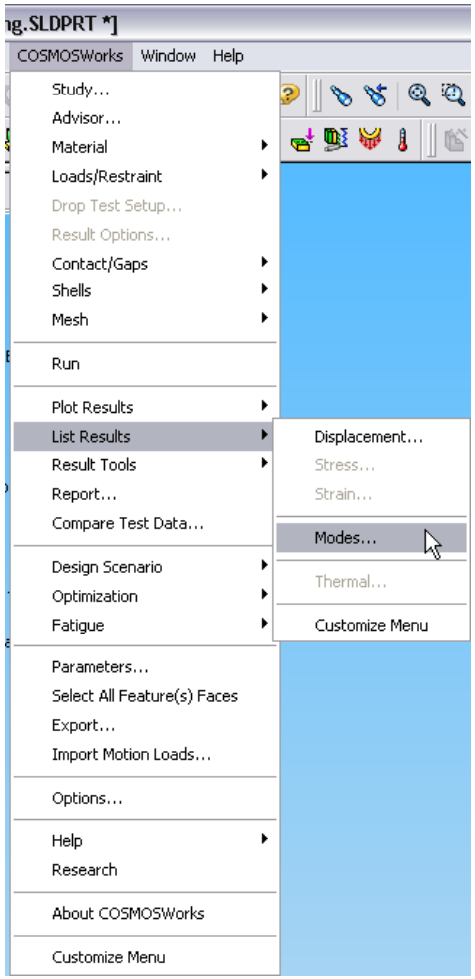
Buckling >> Run

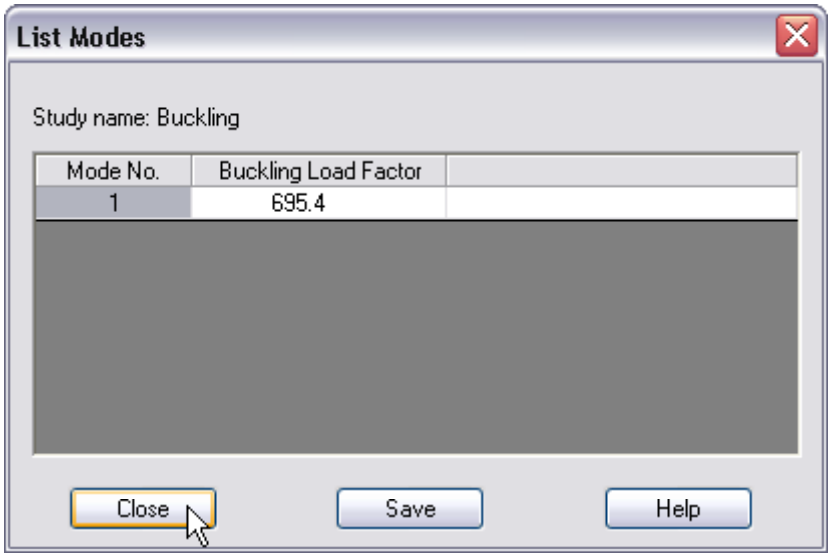




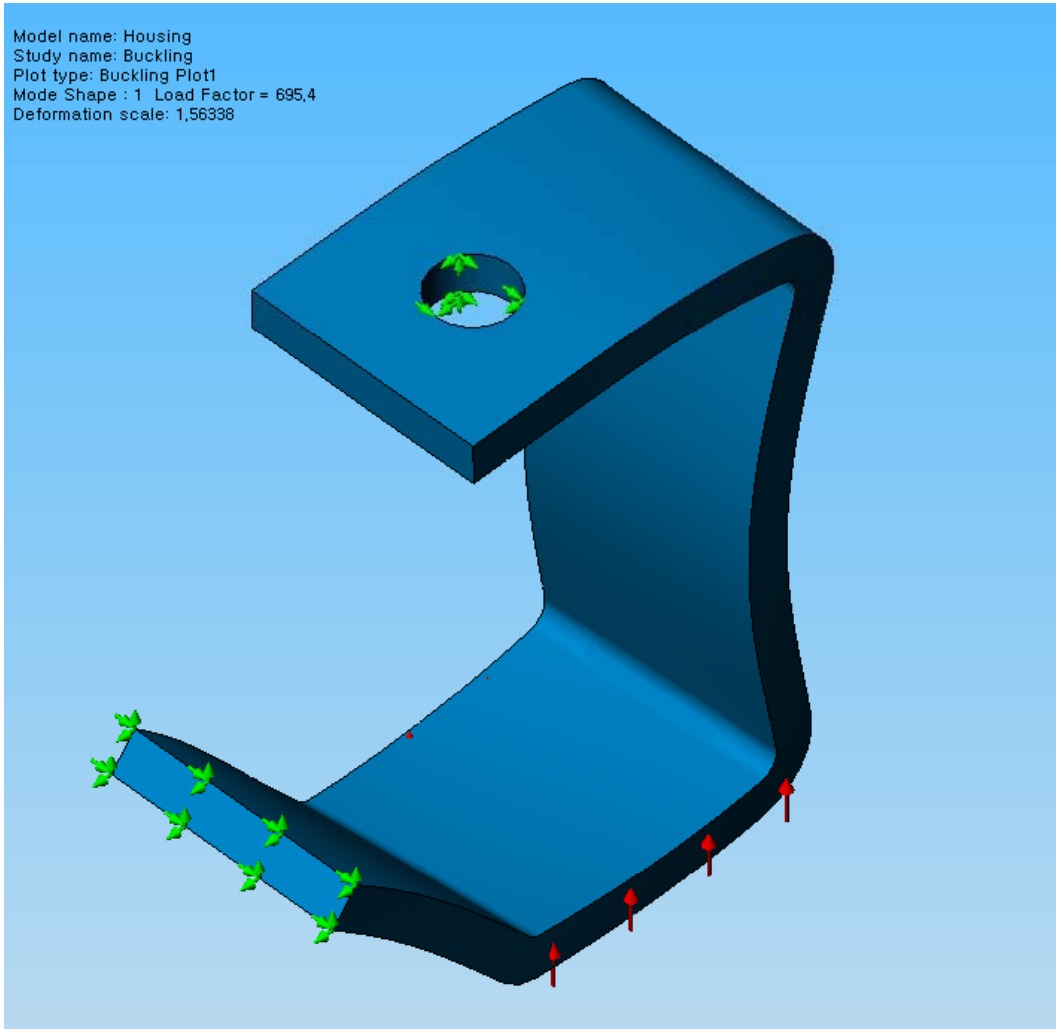
List Result - Mode Shape

COSMOSWorks >> List Result >> Modes





Deformation Plot



Critical Load Factor = 695.4
Critical Buckling Load = 69,540 psi
(Pressure * Critical Load Factor)

Thank You !