Verification Test With Square Plate

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24x24x0.5'' Steel Plate (E=29,007,547 psi μ=0.29)

3 sides of 4 are fixed (hinge), 2000 lb (total) is applied on top

1. Solidworks Simulation/Static Analysis (brick elements)

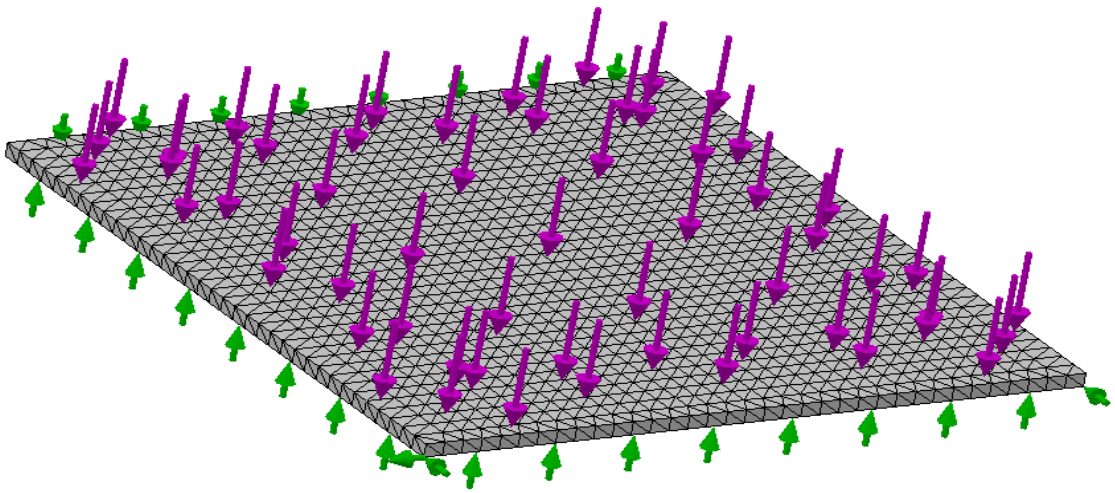


Fig. 1 - Model with BC

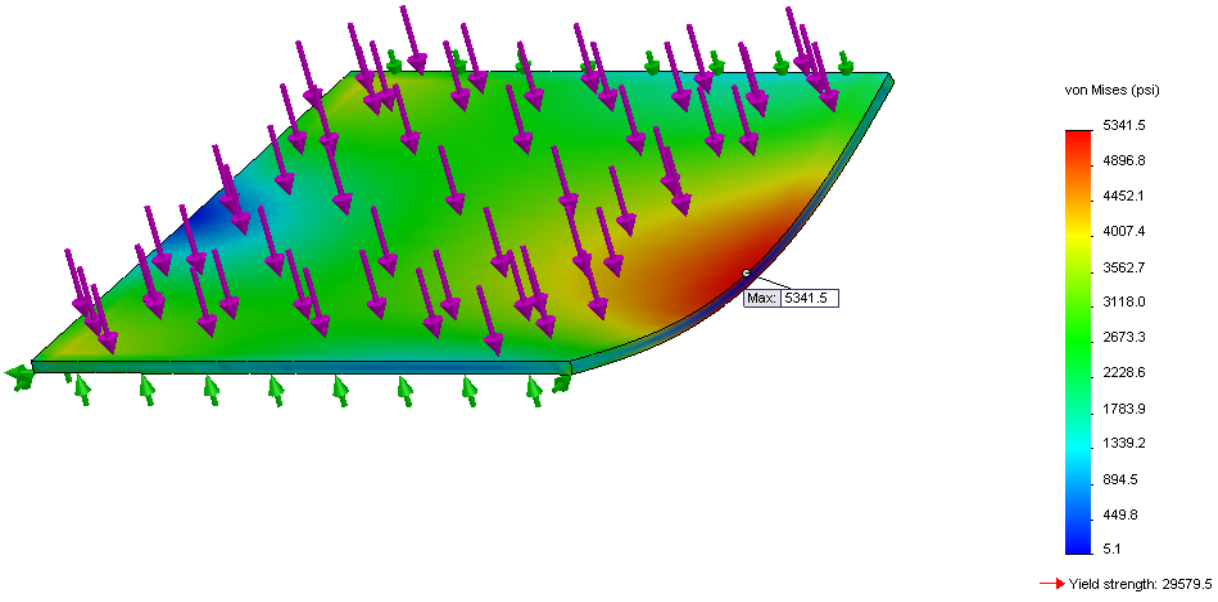


Fig. 2 - Von Mises stress (Solidworks Simulation). Max. Valie is 5341.5 psi

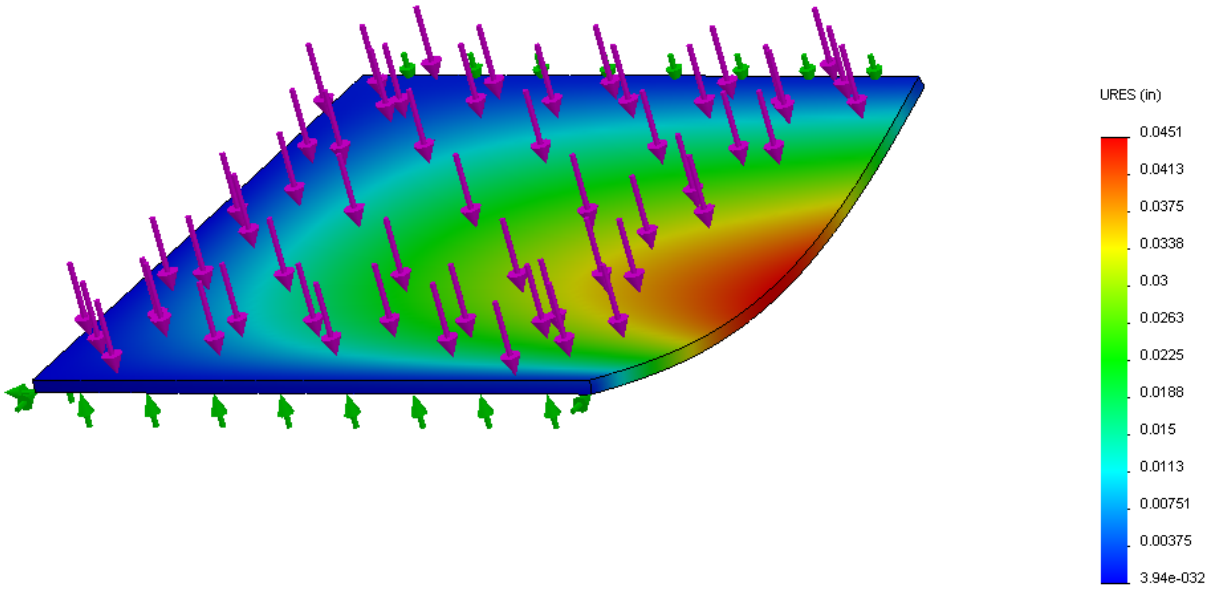


Fig. 3 Max. Displacemets (SolidWorks Simulation). Max. Value is 0.0451 in

2. Solidworks Simulation/Static Analysis (thin shell elements)

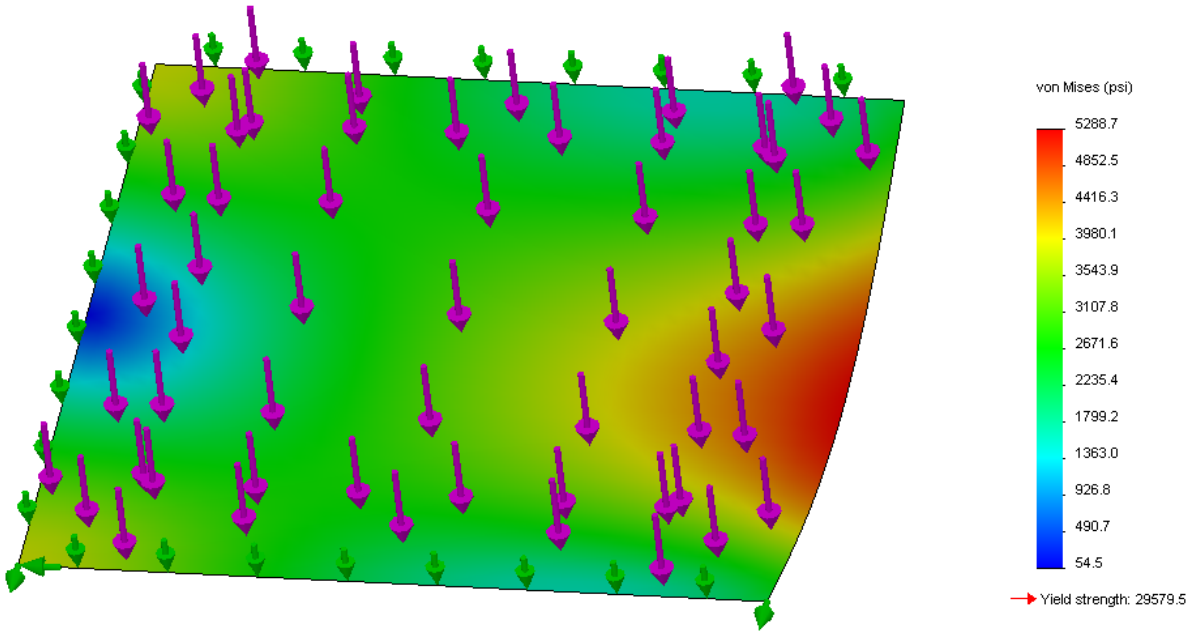


Fig. 4 Max. Stress = 5288.7 psi

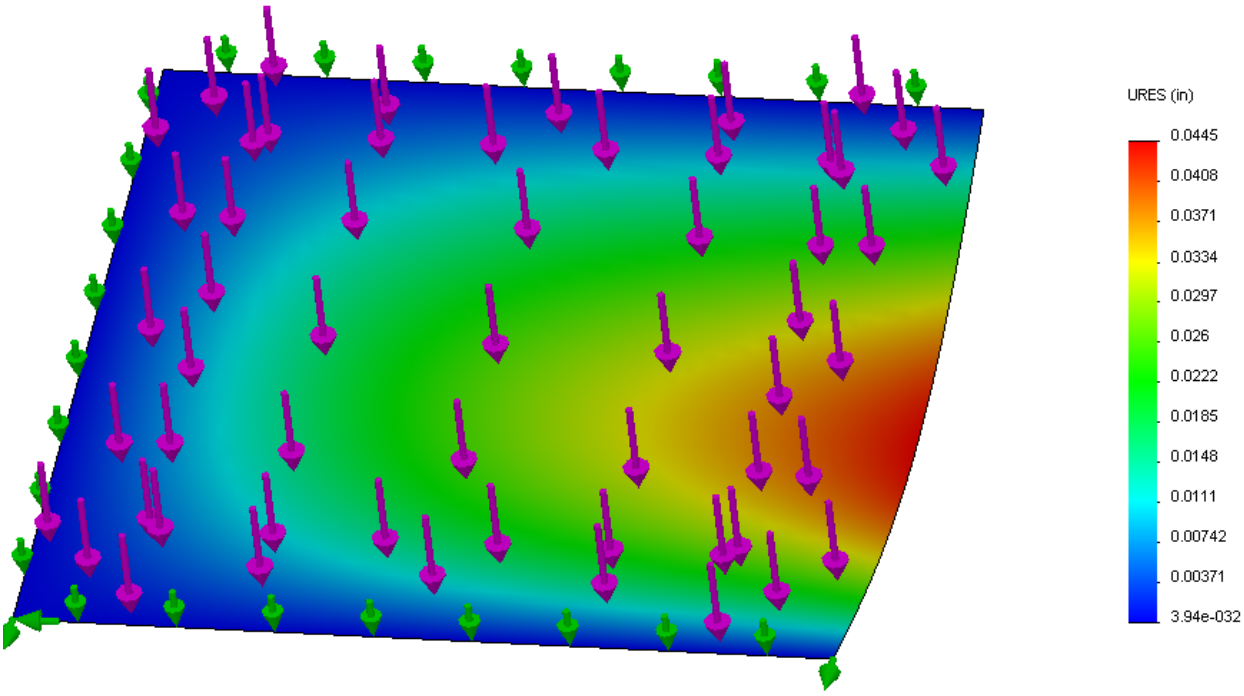


Fig. 5 - Displacements in SolidWorks Simulation (max. Value is 0.0445 in)

3. Solidworks Simulation/Static Analysis (thick shell elements)

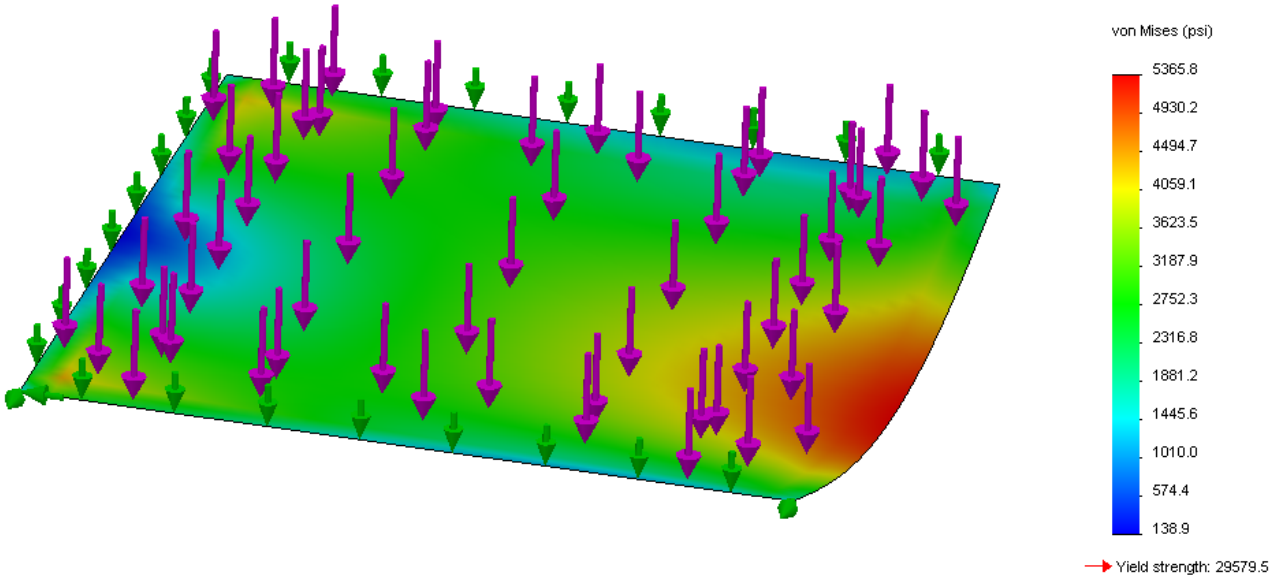


Fig.6 - The plate calculated as thick shell (shell element option) in SolidWorks Simulation, max. Stress = 5365.8 psi

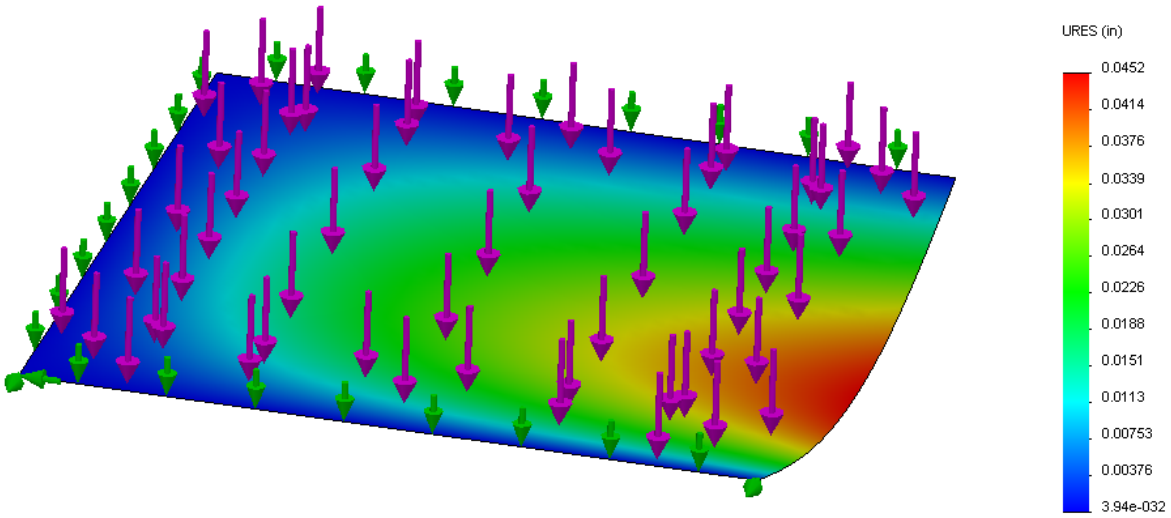


Fig. 7 - Thick Shell (SolidWorks Simulation) Max. Displacement is 0.0452 in

4. ANSYS /Static Analysis (shell elements)

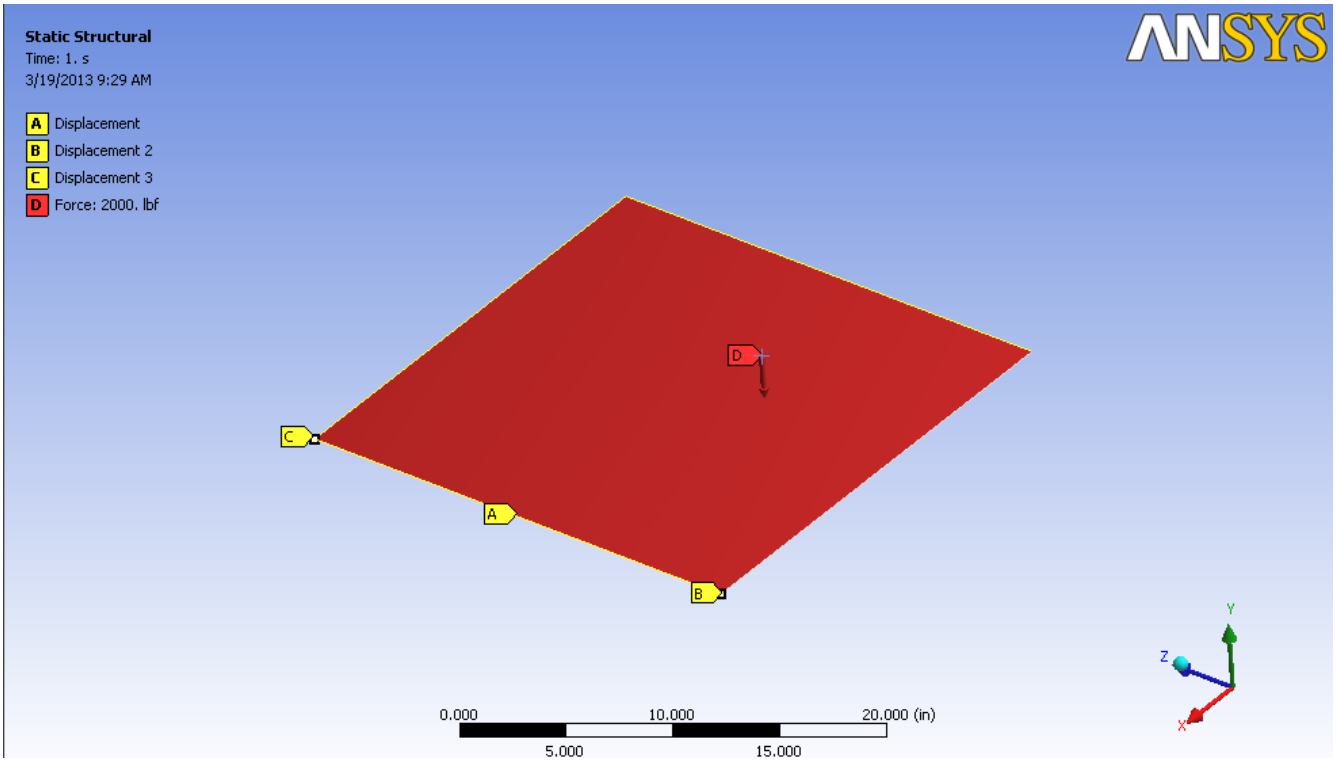


Fig. 8 ANSYS model (with shell elements)

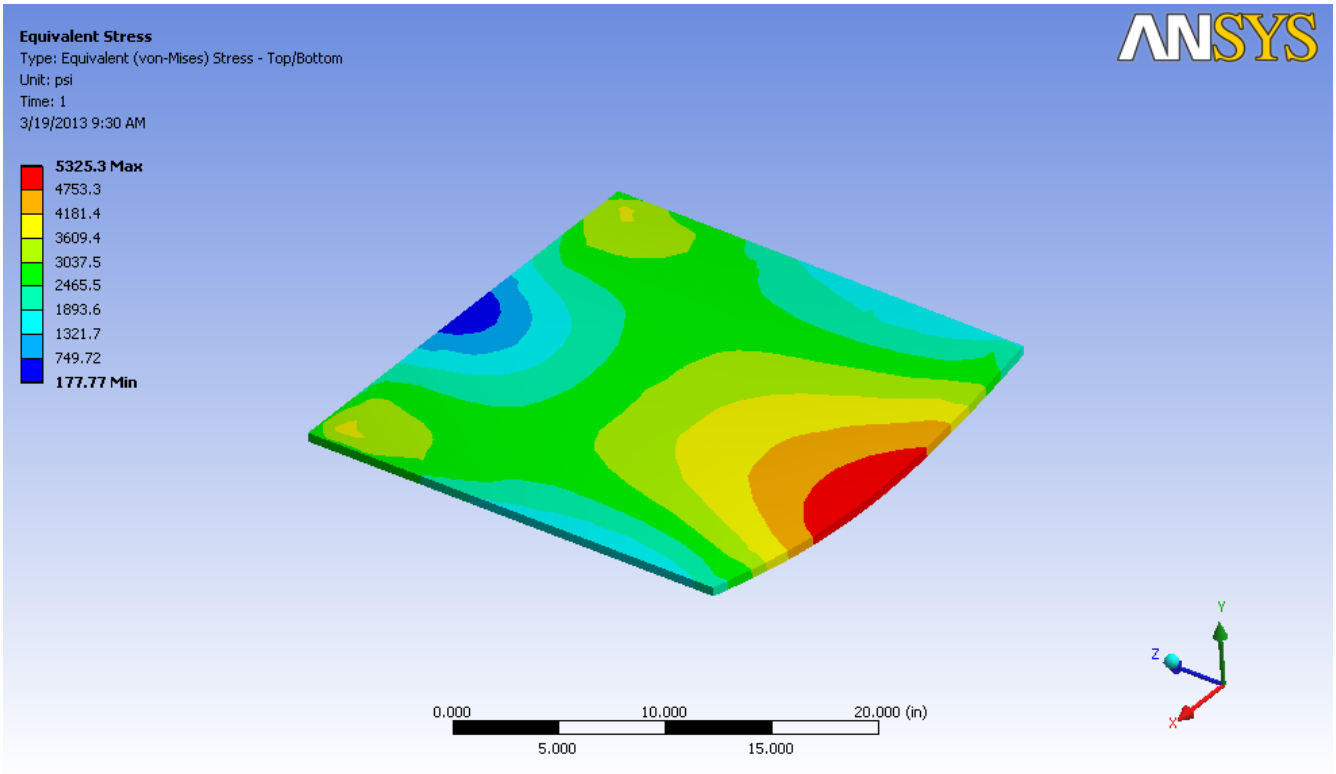


Fig. 9 - Max. Stress (shell elements) = 5325.3 psi

5. ANSYS /Static Analysis (brick elements)

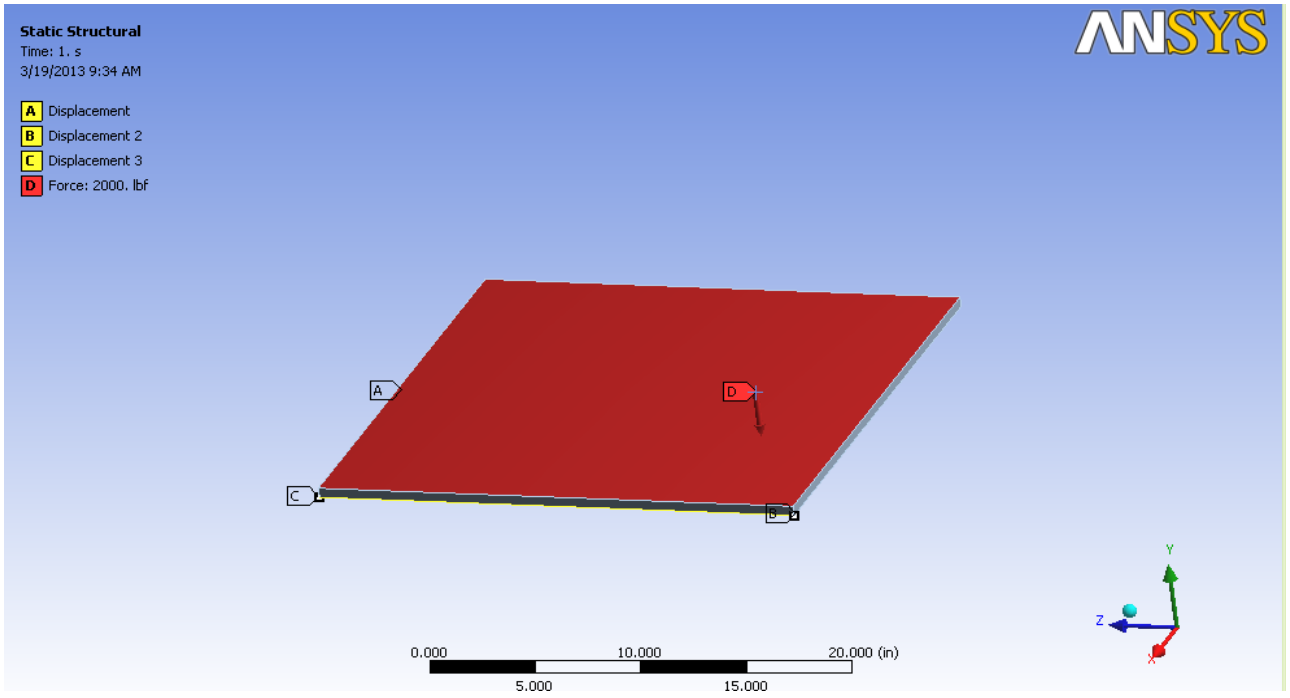


Fig. 10 - ANSYS model with solid elements

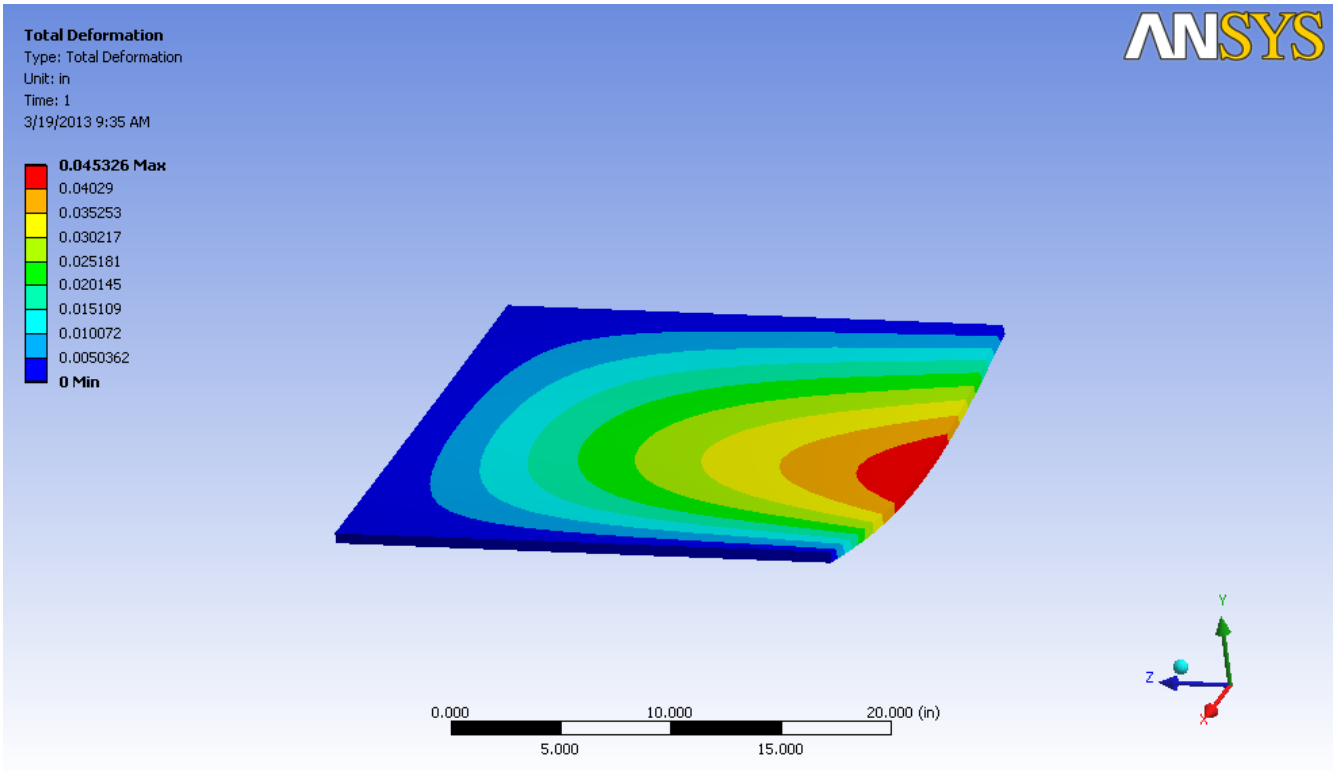


Fig. 11 ANSYS/Solids. Displacements (max. 0.0453 in)

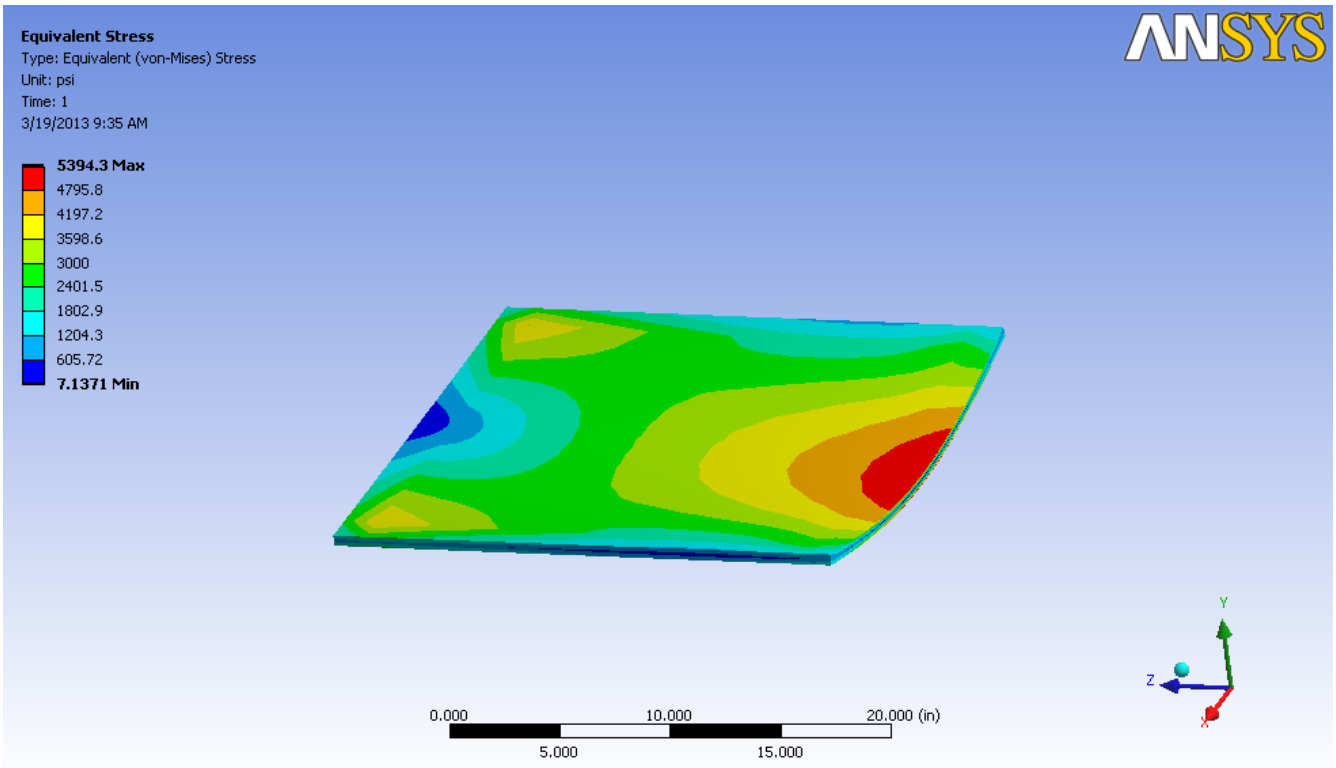
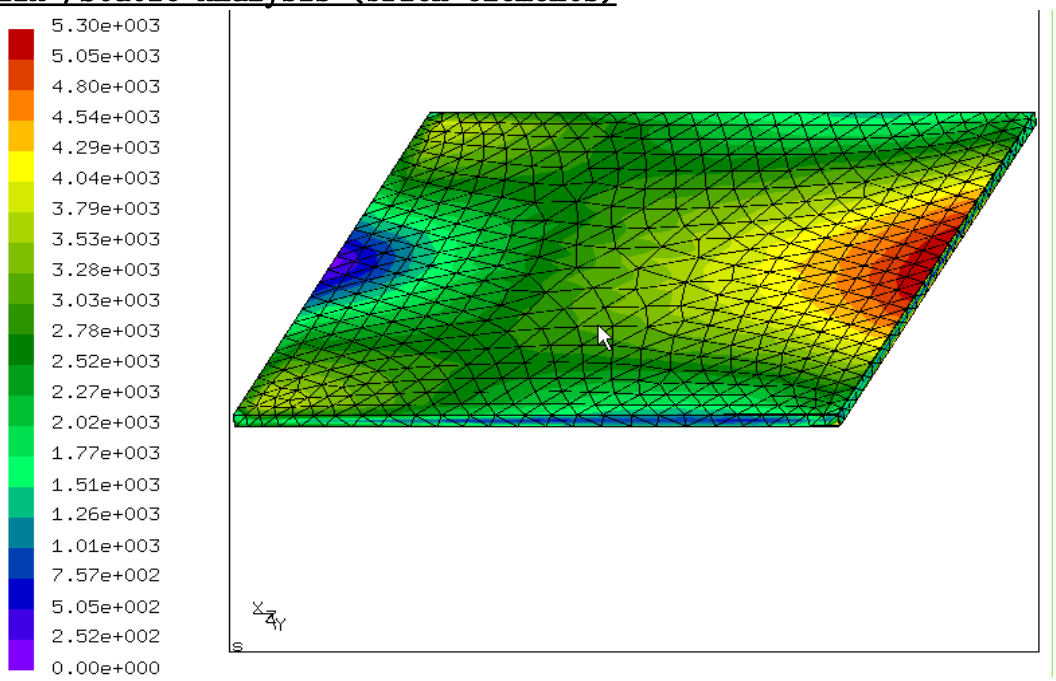


Fig. 12 - ANSYS /solids. Max. Stress = 5394.3 psi

6. CalculiX /Static Analysis (brick elements)



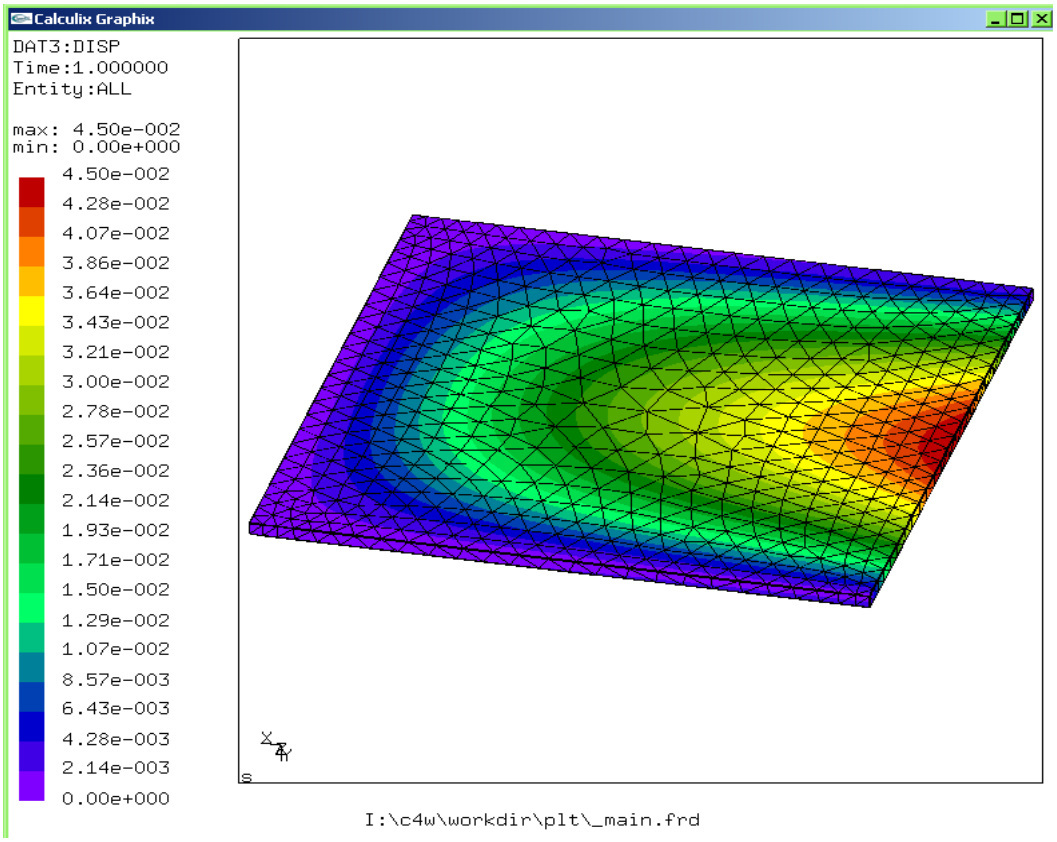
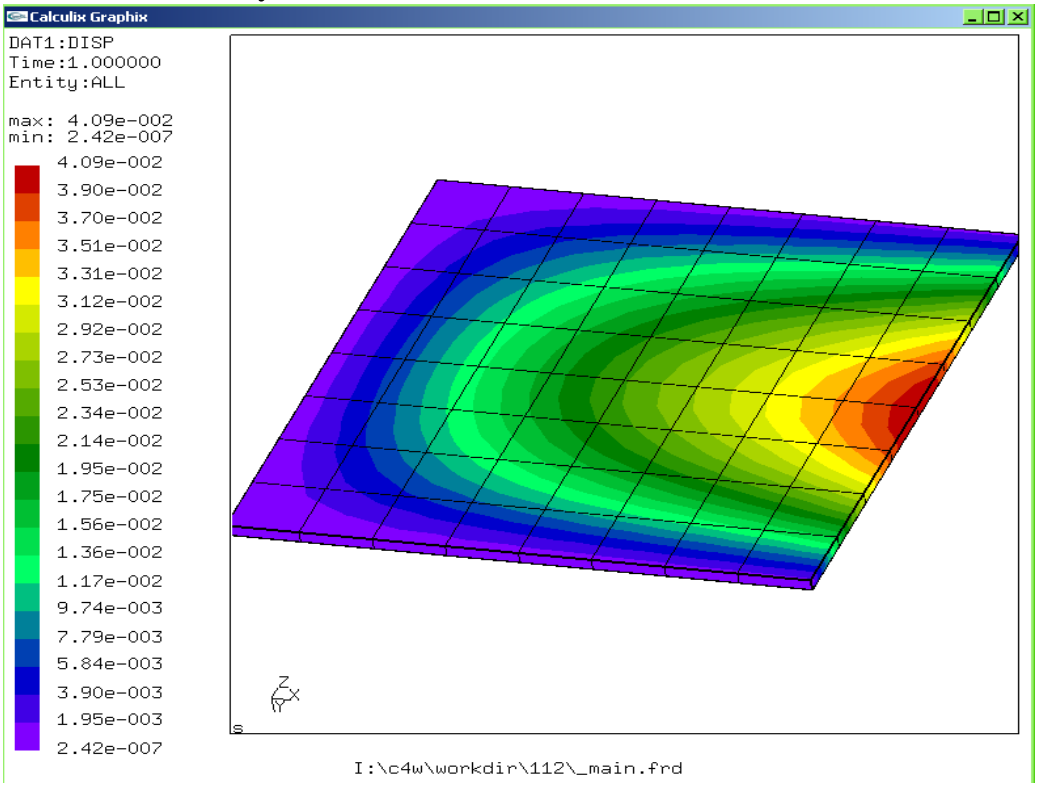


Fig. 13 CalculiX, solid elements: VM Stress = 5300 psi (in the mid-point of free edge) ; Displacement: 0.045inch

7. CalculiX /Static Analysis (shell elements, S8R, S6)



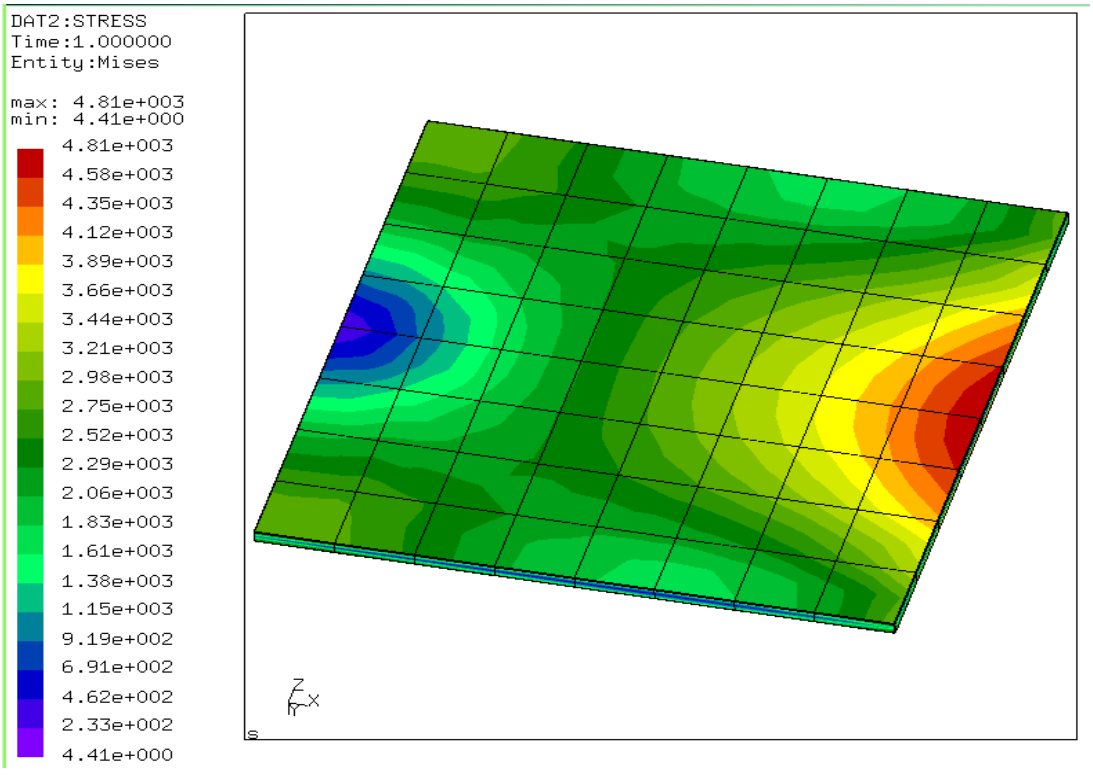
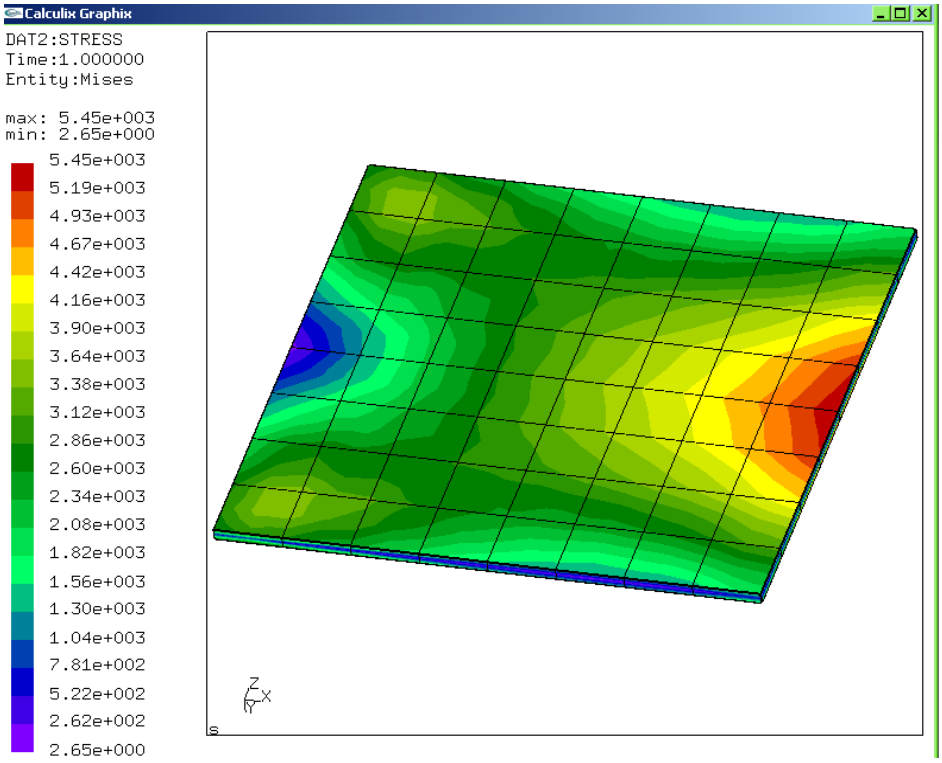


Fig. 14 CalculiX, Rough S8R mesh+load applied to nodes **(not to the faces, it is not the same as above!!)**. VM Stress = 4810 psi (in the midpoint of free edge)
Displacement: 0.041 inch



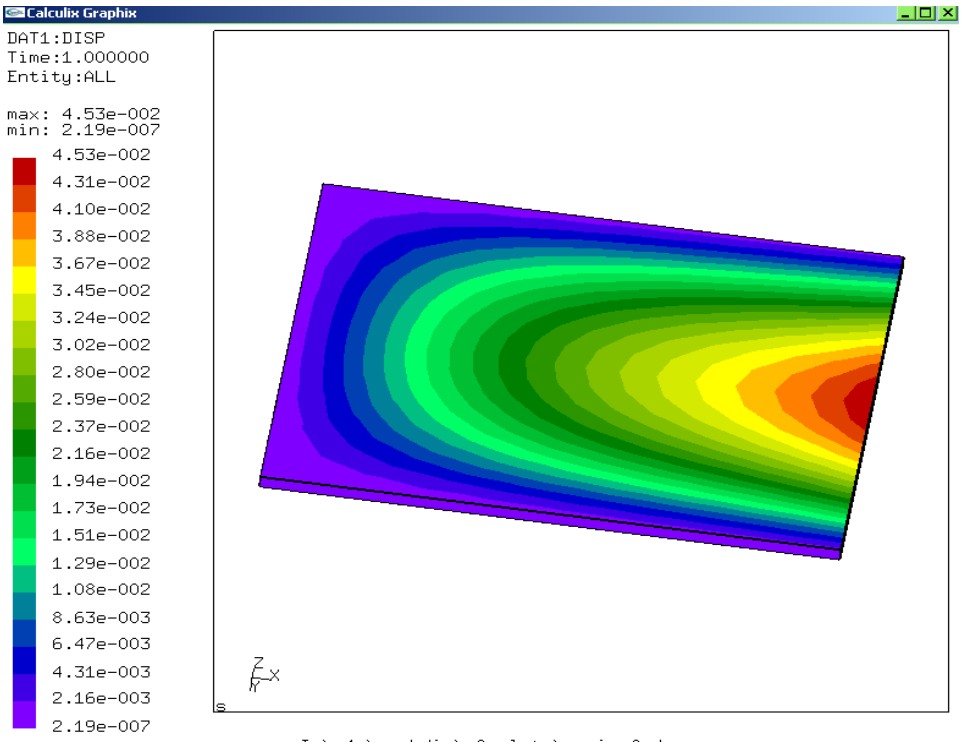
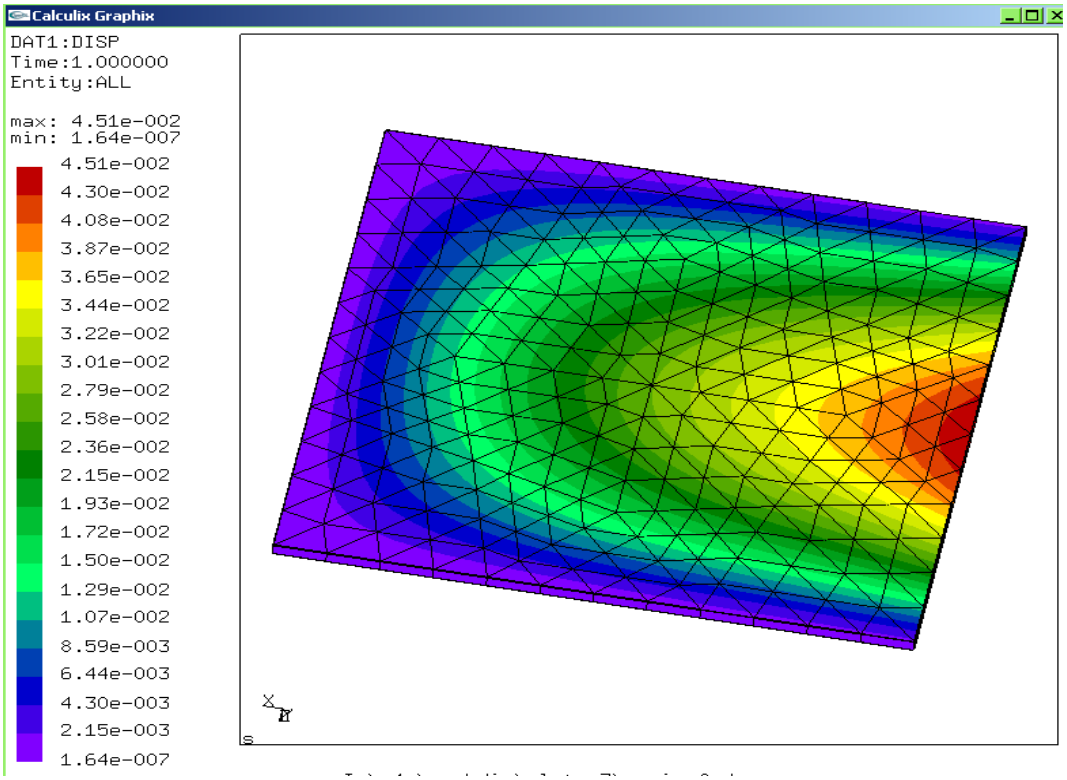


Fig. 15 CalculiX, Rough S8R mesh+load applied to the faces
VM Stress = 5450 psi (in the midpoint of free edge)
Displacement: 0.0453 inch



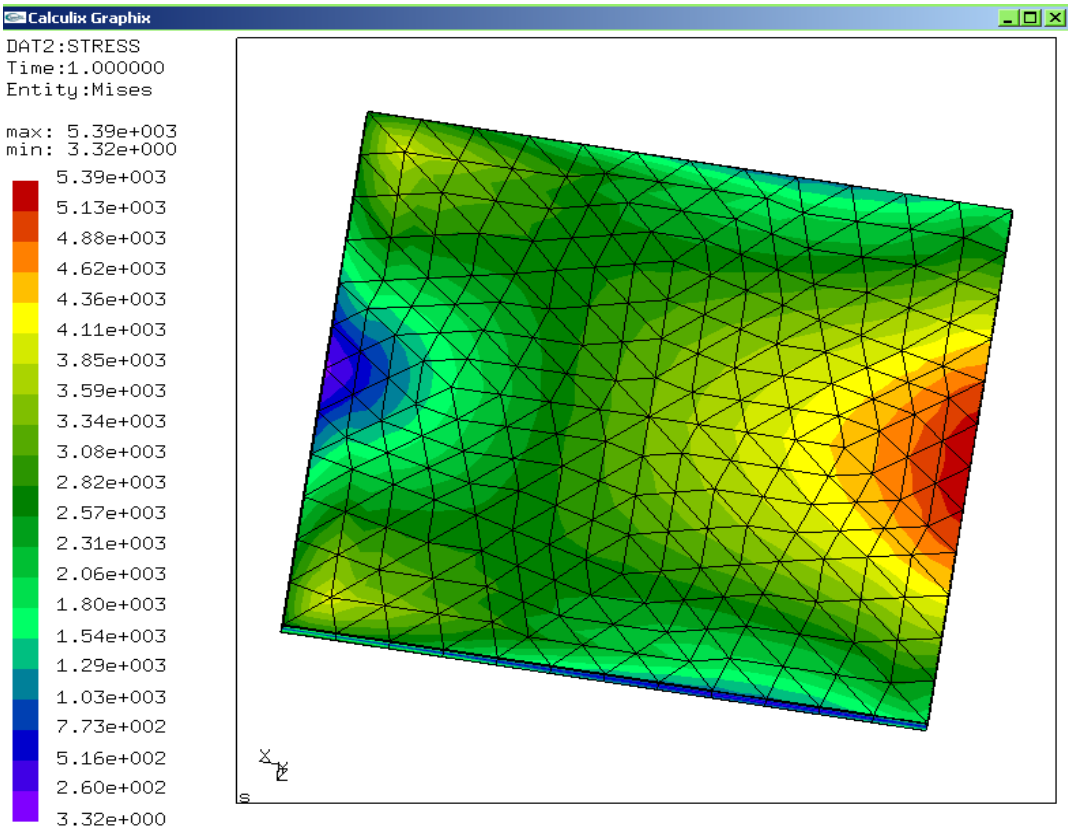


Fig. 16 CalculiX, Rough S6 mesh+load applied to the faces
VM Stress = 5390 psi (in the midpoint of free edge)
Displacement: 0.0451 inch