Universitat Politenica de Catalunya

Computational Mechanics Tools - Non Linear Analysis ABAQUS

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1.1 Case 1: Elasticity Case

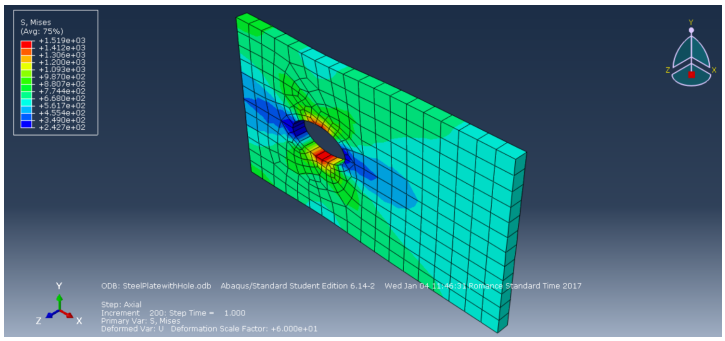

Figure 1.1: Von Mises Stress : Elasticity case

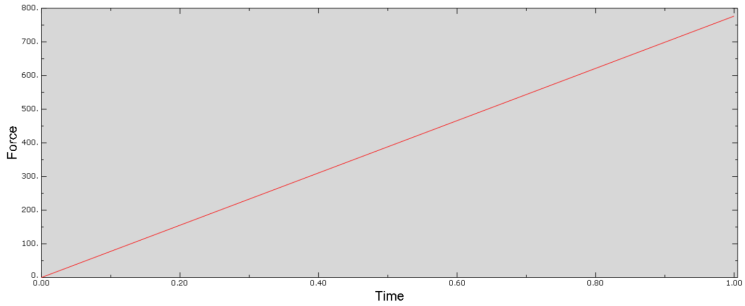

Figure 1.2: Force VS Displacement :Elasticity

In the above case we can see that the stress plot for a perfectly elastic case.Since the this material is an elastic material the force should be proportional with displacement which can be see from the graph above.it is very evident from the plot that it is obeying Hooke's law.

1.2 Case 2: Perfectly Plastic

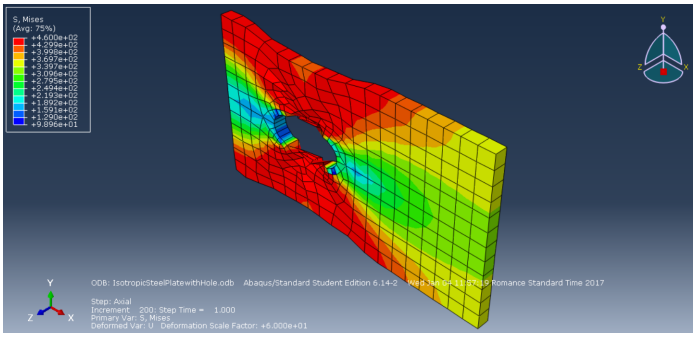

Figure 1.3: Von Mises Stress : Perfectly plastic case

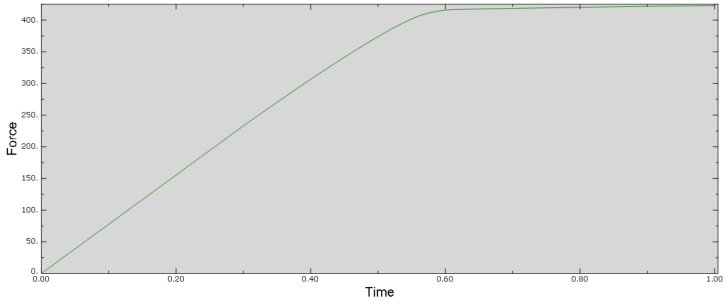

Figure 1.4: Force VS Displacement :Perfectly plastic case

The above stress plot is for the perfectly plastic case. We can see that the body when subjected to a load it displaces in proportion to the force until the yield limit and beyond this the plot becomes flat.It does not remain linear beyond yield stress i.e 460MPa.Here we can say the plot tends to infinity beyond the elastic limit.

1.3 Case 2: Plasticity 1

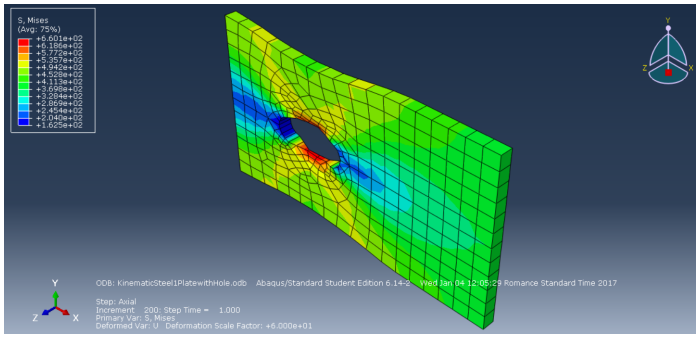

Figure 1.5: Von Mises Stress : Plasticity1 Case

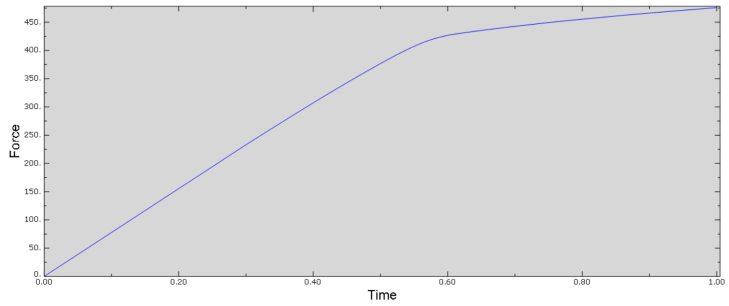

Figure 1.6: Force VS Displacement :Plasticity1

In this case the we can see the stress plots for an plasticity case.Here the first plastic zone is till 460MPa and from 520MPa we define other plastic zone with plastic strain of 0.005mm so we can see that the slope of the force time plot decreases after 460MPa.

1.4 Case 2: Plasticity 2

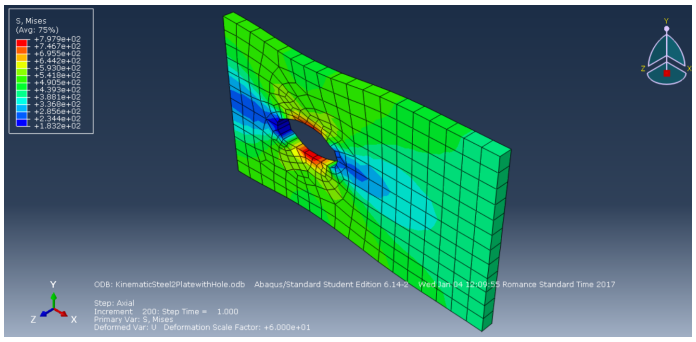

Figure 1.7: Von Mises Stress : Plasticity2 Case

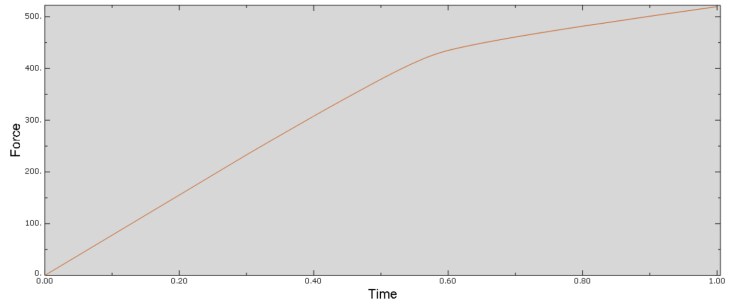

Figure 1.8: Force VS Displacement :Plasticity2

In this case the yield limit is the same as previous case but here the plastic strain corresponding to 520MPa is 0.002mm.Here the slope of the plastic phase above 460MPa will be more than the previous case as we are setting the same yield stress with a lower strain.

2 Analysis for Pin Plate

2.1 Case 1: Elasticity

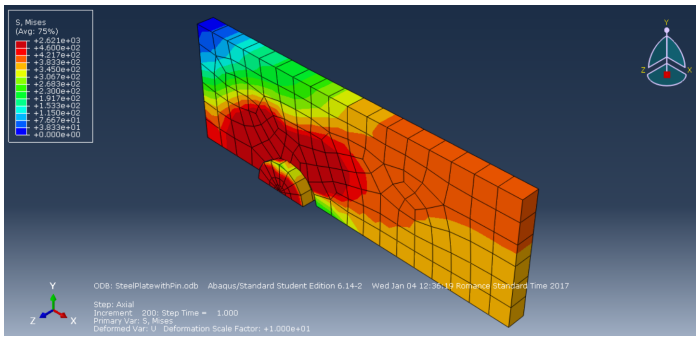

Figure 2.1: Von Mises Stress : Elasticity Case

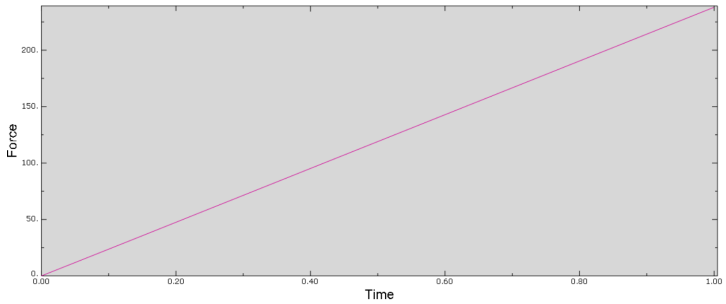

Figure 2.2: Force VS Displacement :Elasticity

From the plots we can see the stress distribution for the elastic case.In this case we can see that the force variation is linear with time and would be of the same nature for displacement.It is obeying the Hooke.s law.we can see that major portion of the assembly is being subjected to high stresses which is the red region.

2.2 Case 2: Plasticity 1

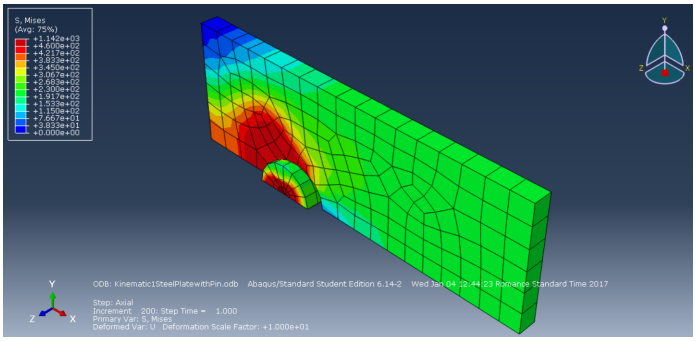

Figure 2.3: Von Mises Stress : Plasticity1 Case

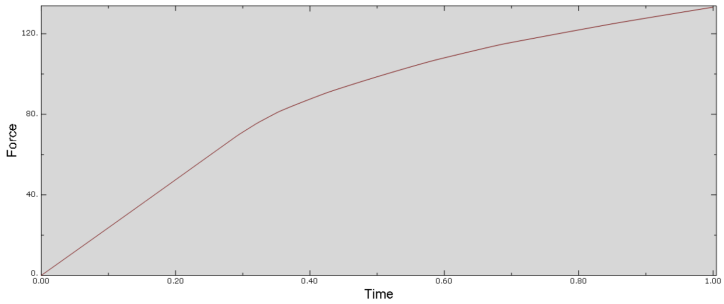

Figure 2.4: Force VS Displacement :Plasticity1

In this case we are giving the two material some plastic properties.We set the yield stress with a plastic strain of 0.005mm same as we used in the previous example.From the stress plot we can see that the lesser region of the assembly is under higher stress values (red region).This means the force applied is getting utilized to deform thereby reducing high stress zones.

2.3 Case 3 : Plasticity 2

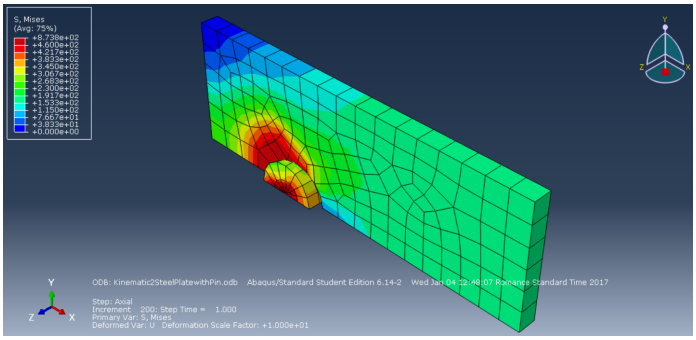

Figure 2.5: Von Mises Stress : Plasticity2 Case

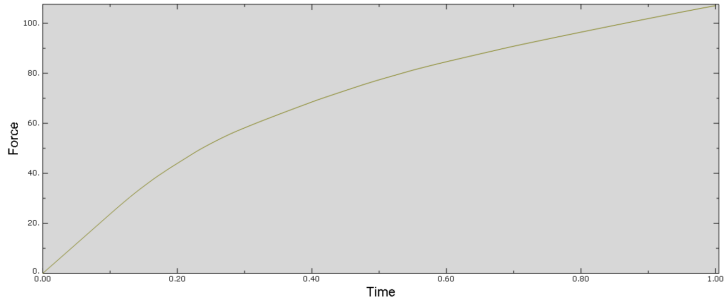

Figure 2.6: Force VS Displacement :Plasticity2

From the above plot we can see the stress distribution in the plastic case with plastic strain of 0.002 with the same yield stress values. we can see that the force time variation is a smooth curve.The slopes is increasing in this case more rapidly than the previous.The stresses region (red zone) compared to all the previous cases.