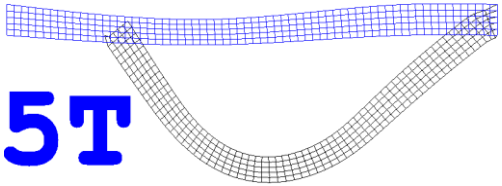
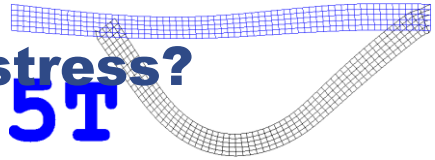


Comparison of stress directions in the insert when subjected to perpendicular and angular shearing

Jan Hernelind, 5T Engineering AB

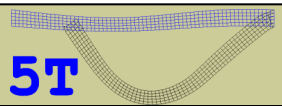
What is the direction for maximum principal stress?



- Comparison of stress directions for two cases:
  1 – horizontal shearing, quarter-point
  2 – shearing (tension) at 22.5 degrees,quarter-point

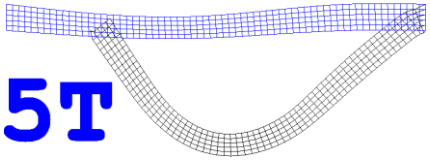
- Bentonite density 2050 kg/m^3
- Shearing amplitude 5 cm

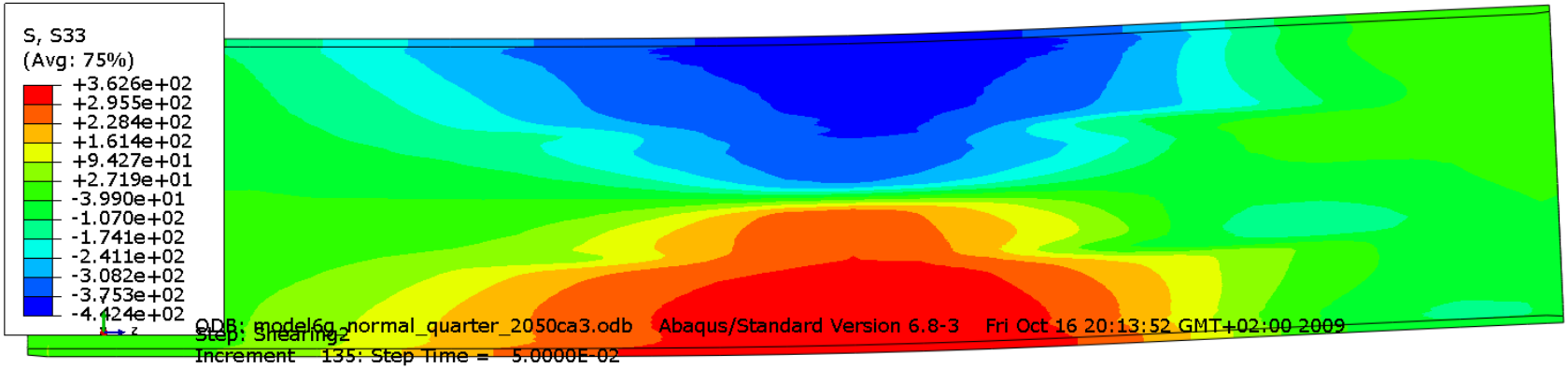
- Surface stresses and internal stresses are analysed

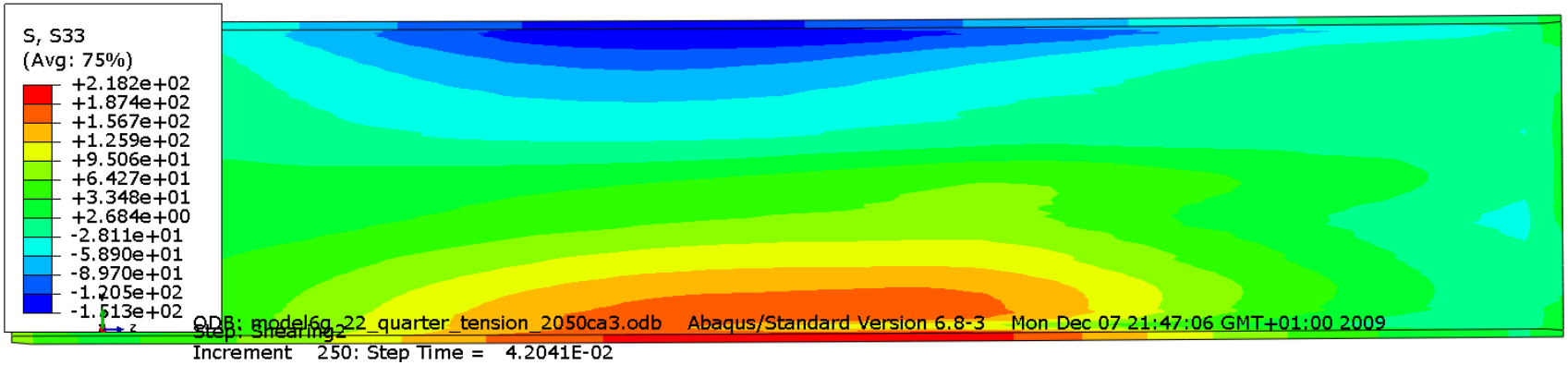


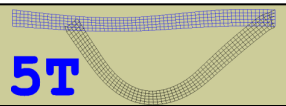
Plots of S 33 (axial stress in the surface)

Top: Horizontal shearing
Bot: Tension shearing at 22.5 degrees







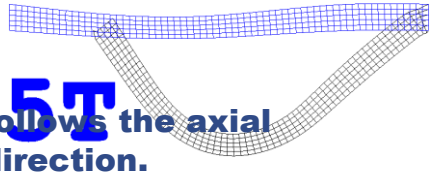


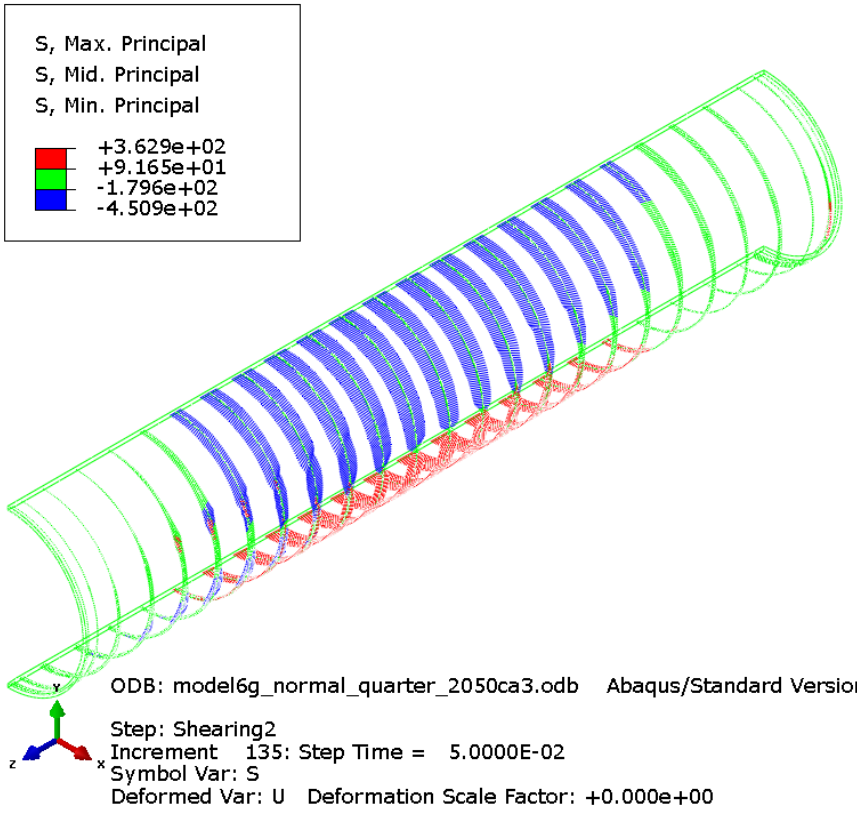
Overview of principal stresses in the surface

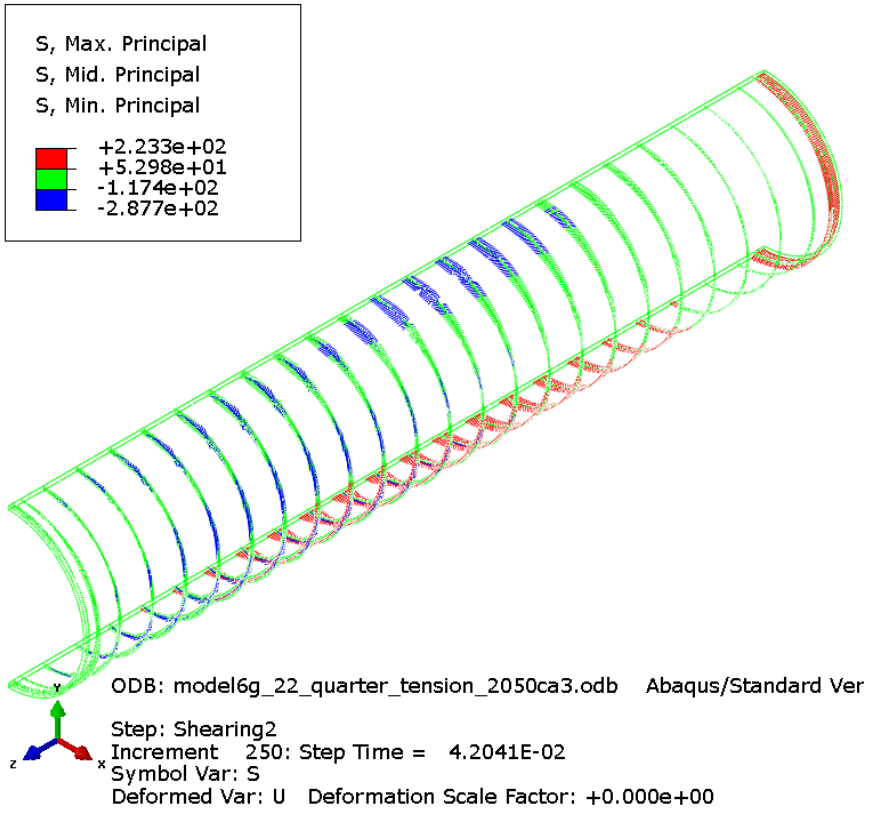
Left: Horizontal shearing

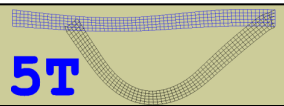
Right: Tension shearing at 22.5 degrees

At the tensile surface, S,max the principal stress component(red arrows) follows the axial direction and the principal stress component S min follows the tangential direction.





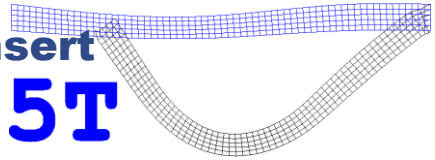


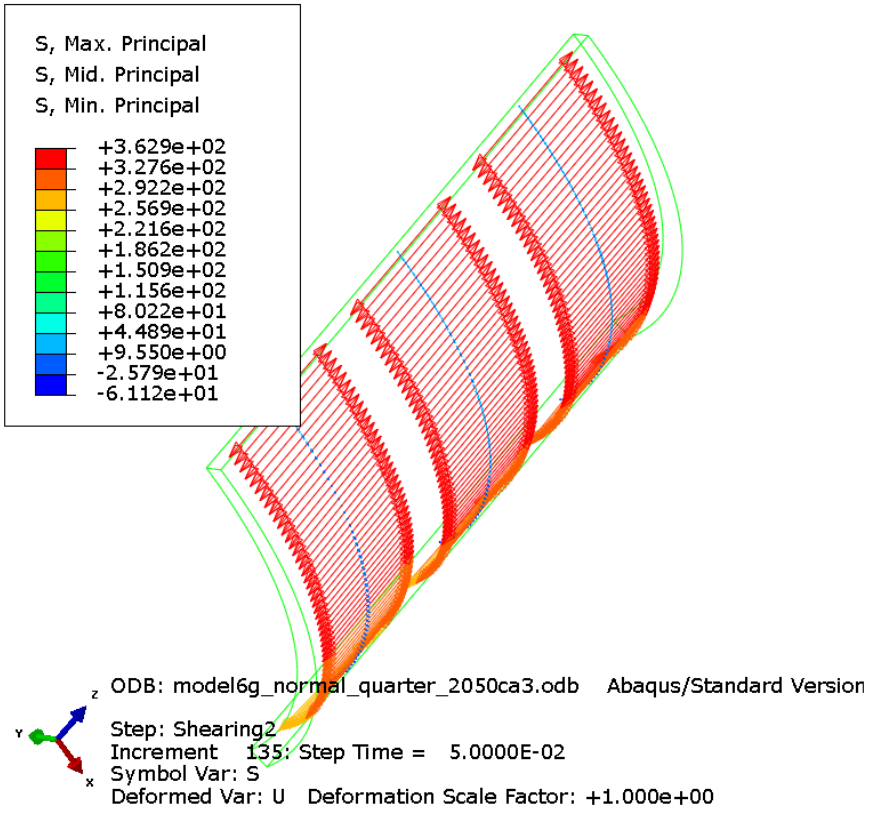


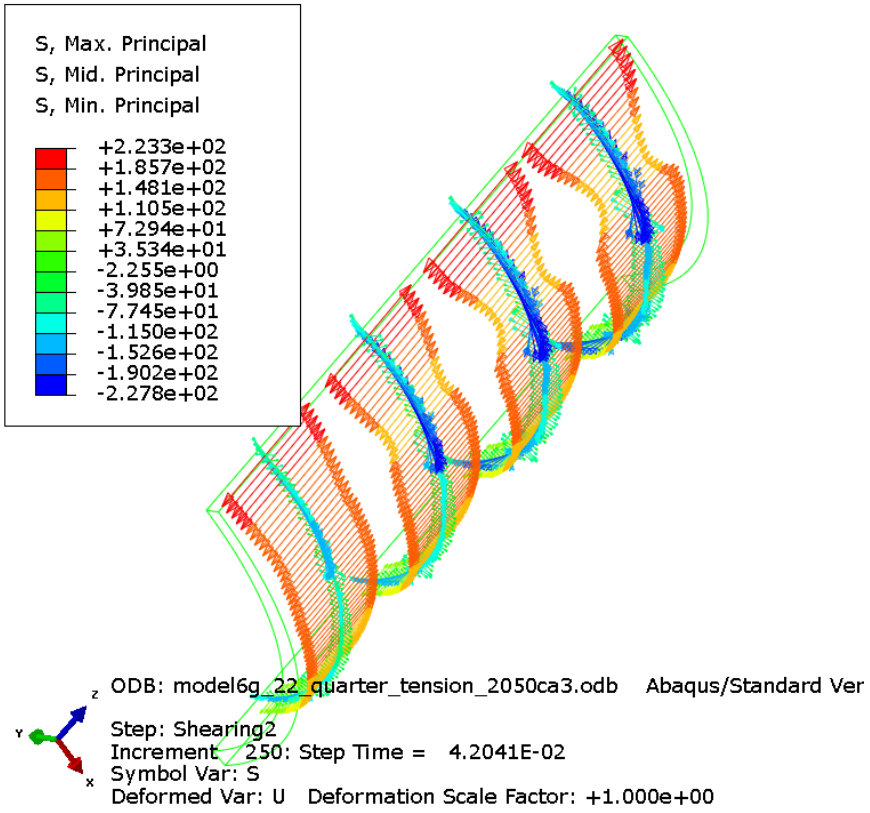
Principal stresses Smax directed along the axis of the insert

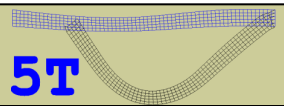
Left: Horizontal shearing

Right: Tension shearing at 22.5 degrees





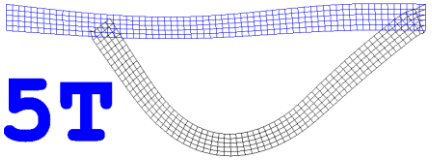


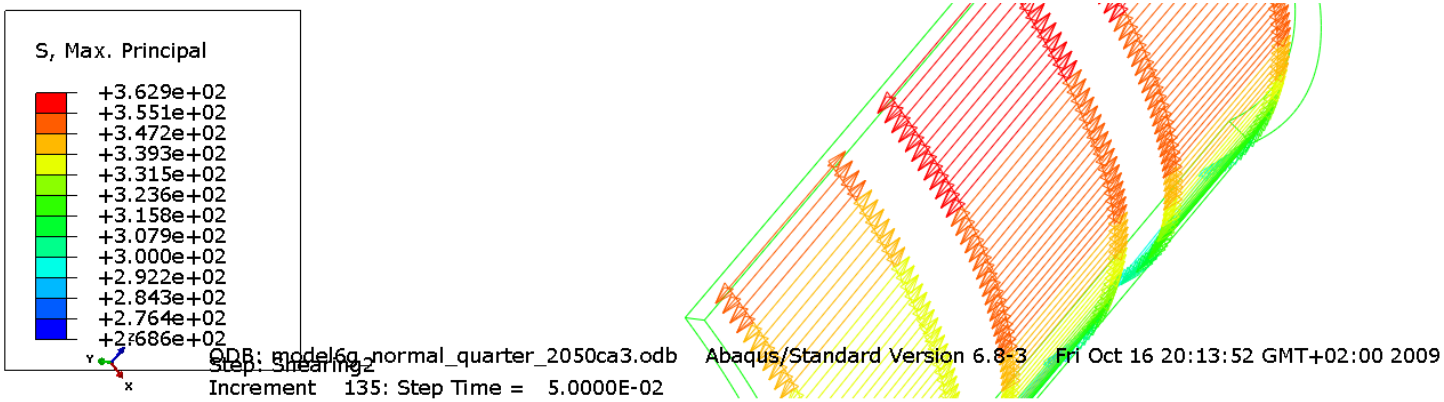


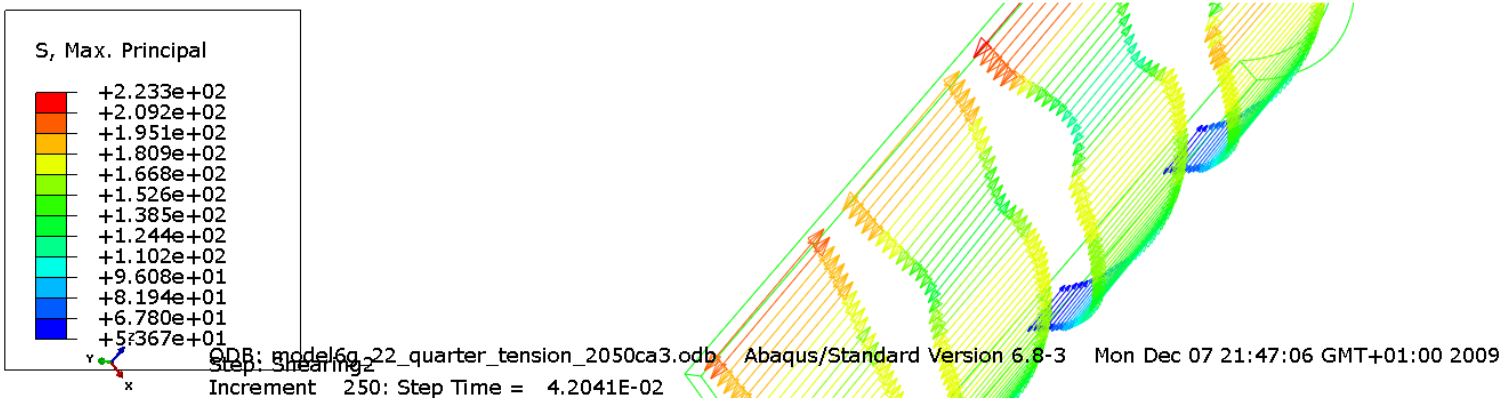
Detail at the zone of maximum stresses

Top: Horizontal shearing

Bot: Tension shearing at 22.5 degrees







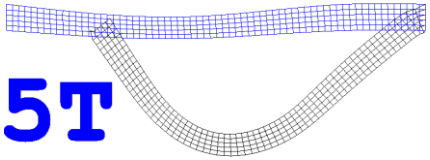
5T

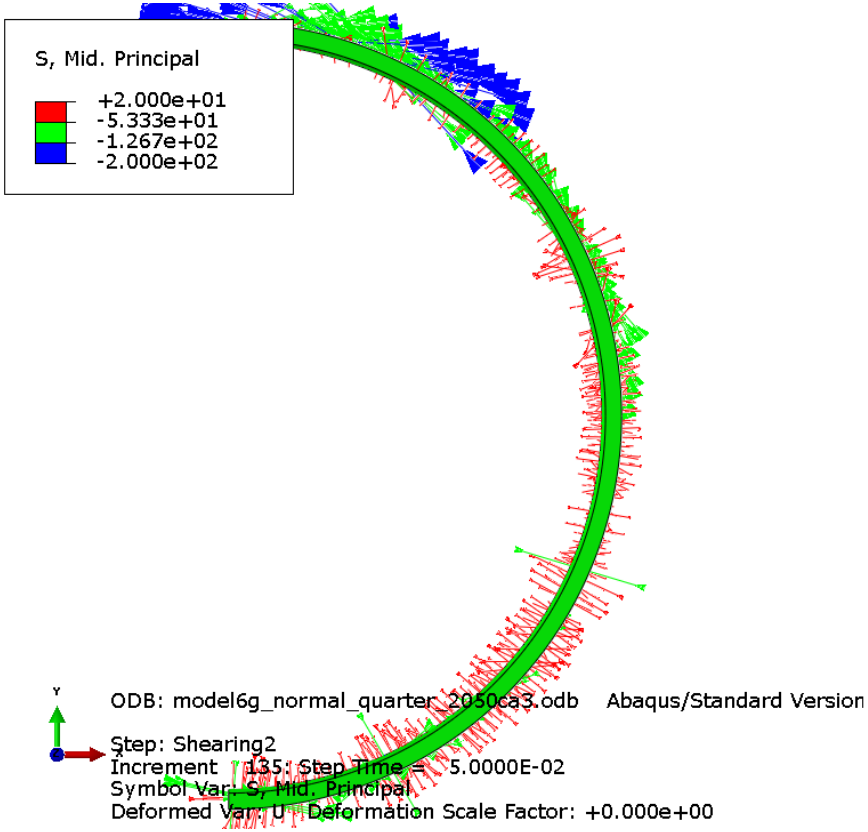
Mid principal stresses

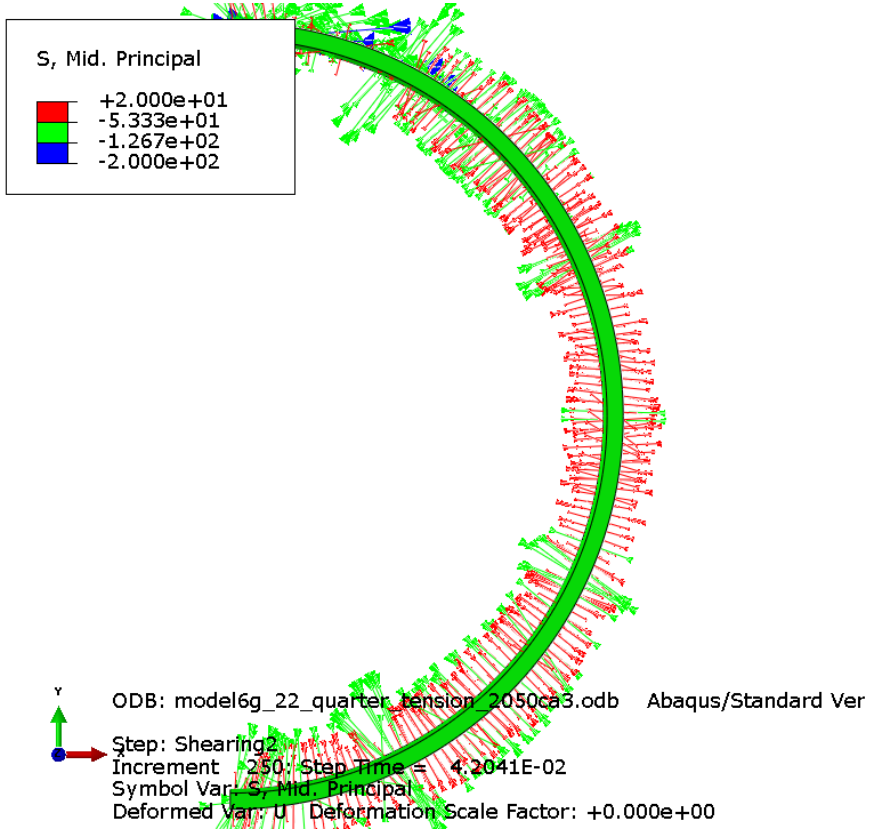
Left: Horizontal shearing

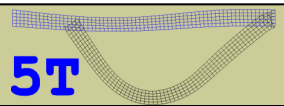
Right:Shearing (tension) at 22.5 degrees

S mid in radial direction and mainly compressive







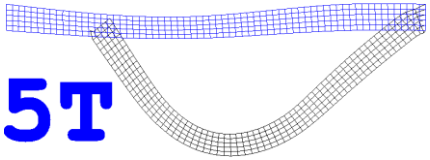


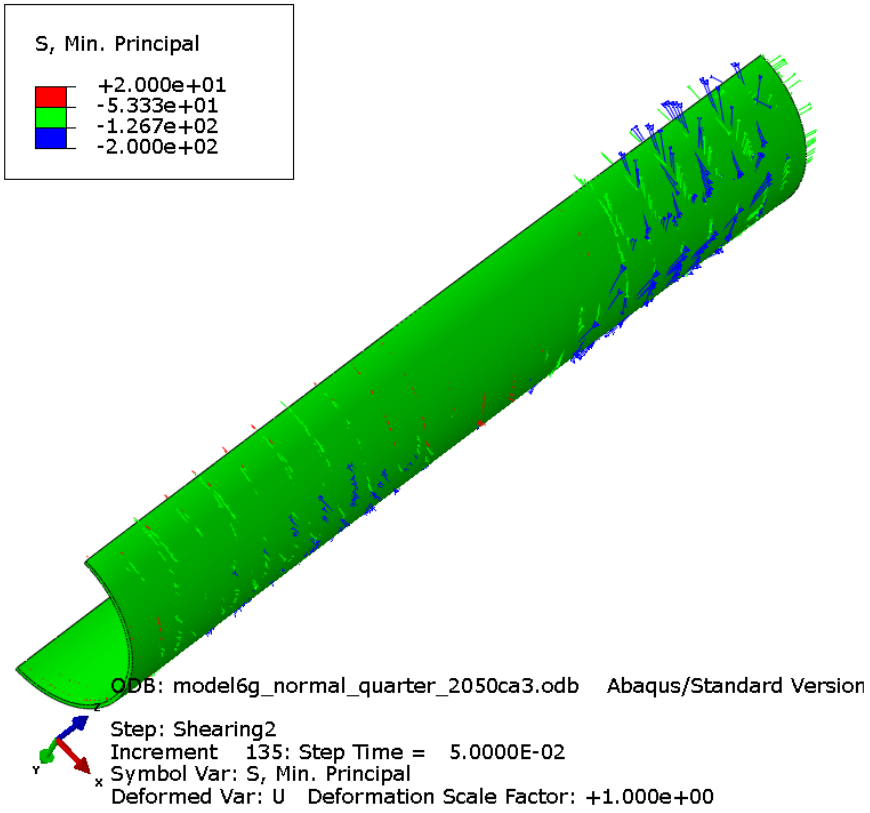
Min principal stresses

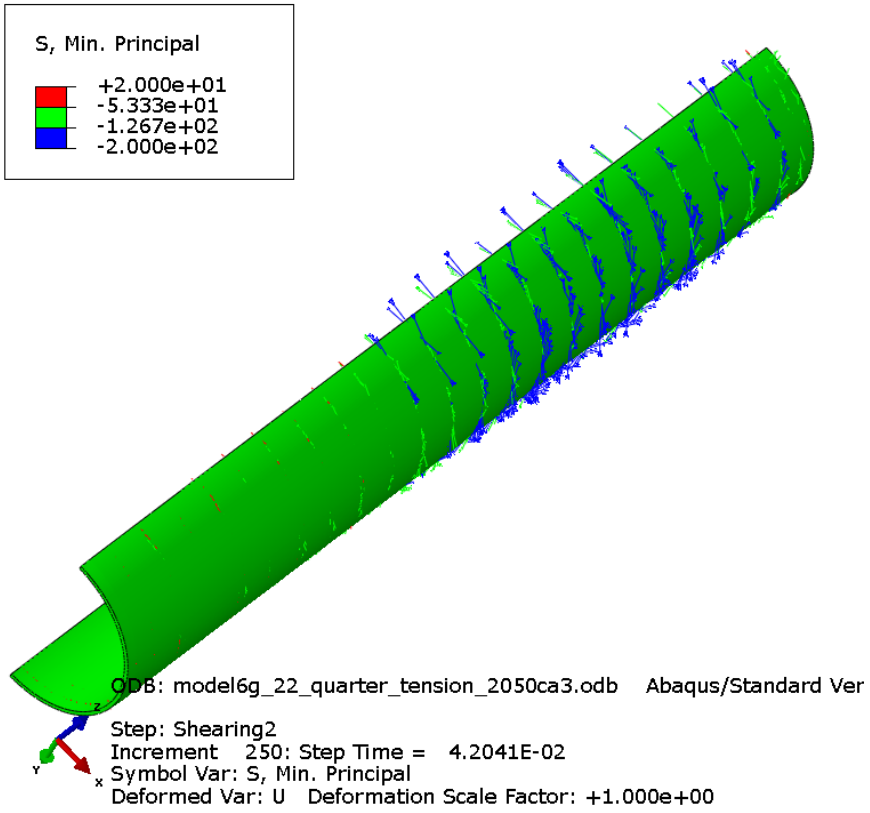
Left: Horizontal shearing

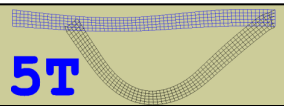
Right: Shearing (tension) at 22.5 degrees

Smin in radial direction, mainly compressive

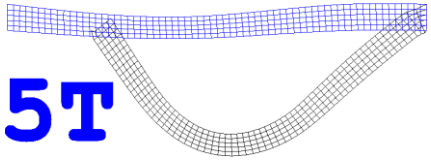




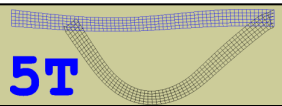




Internal principal stress



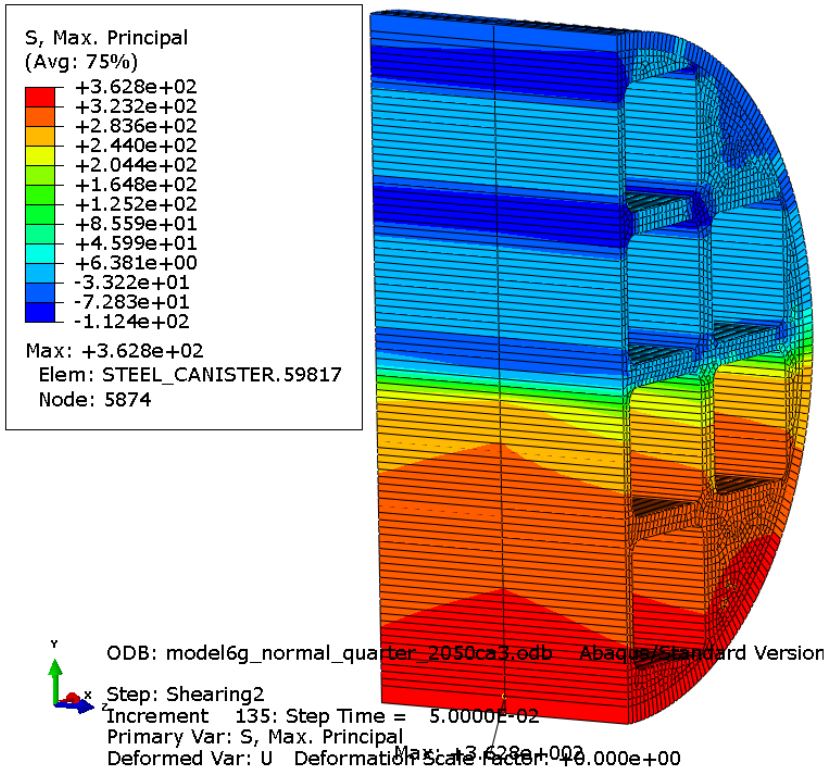
- **Analyzed in the cross section with the highest stress levels, same loadcase as for surface stresses.**

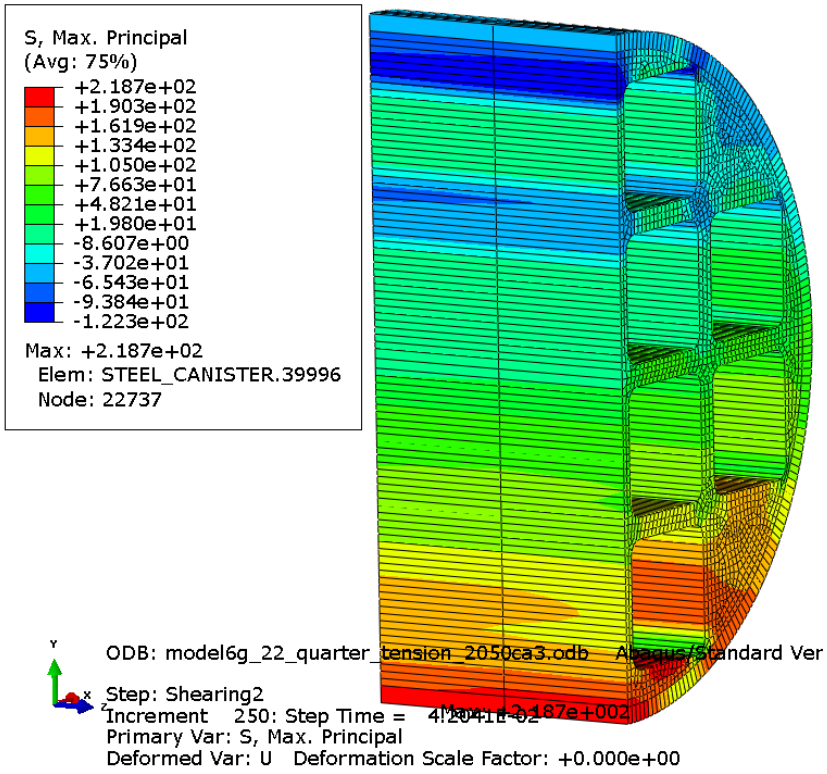


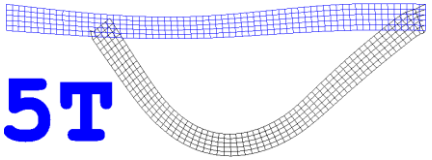
Principal stress S, max

Left: Horizontal shearing

Right:Shearing (tension) at 22.5 degrees



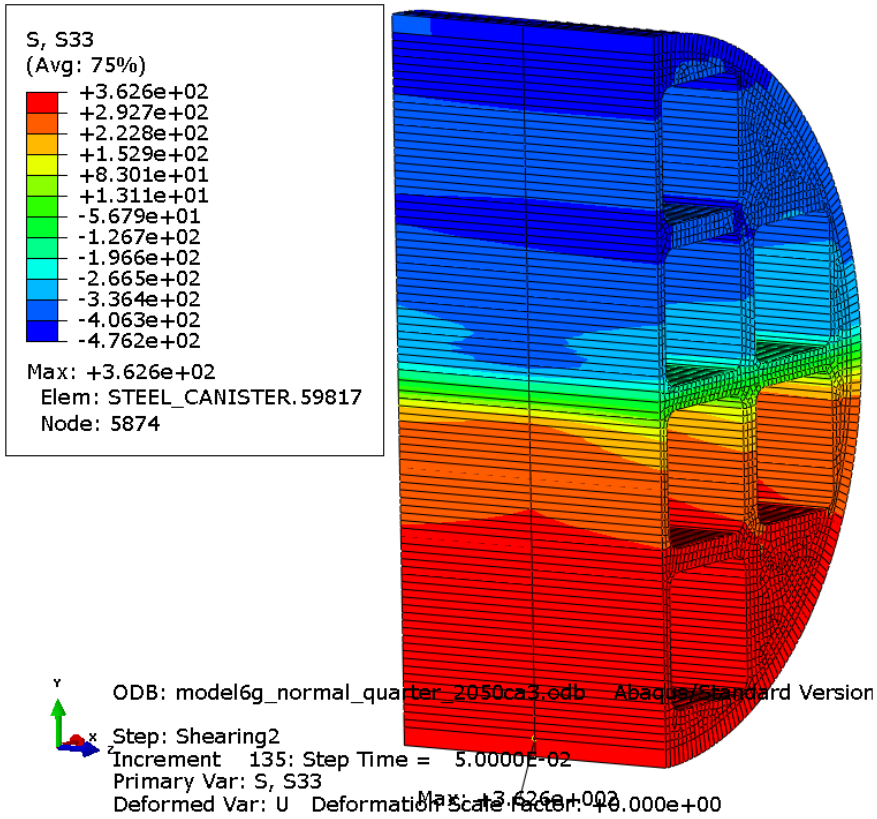


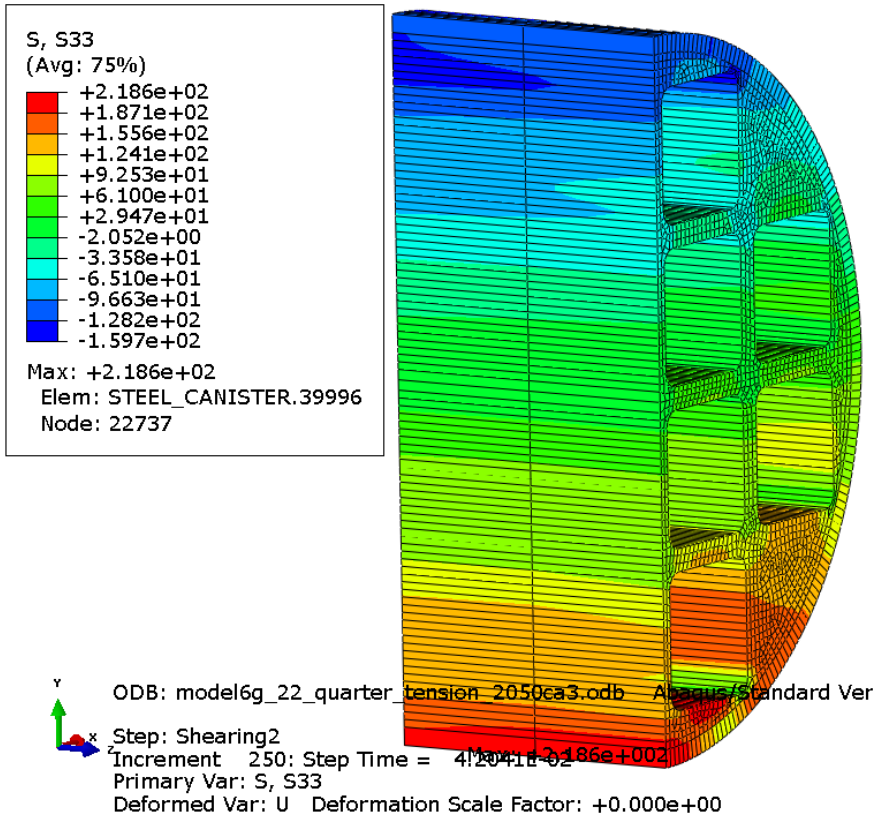


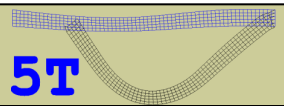
Axial stress S33

Left: Horizontal shearing

Right:Shearing (tension) at 22.5 degrees







Vector plot, sectionen at highest Smax

Left: Horizontal shearing

Right:Shearing (tension) at 22.5 degrees

Smax in axial direction in both cases