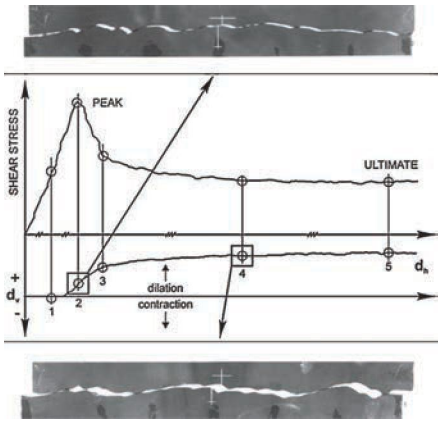
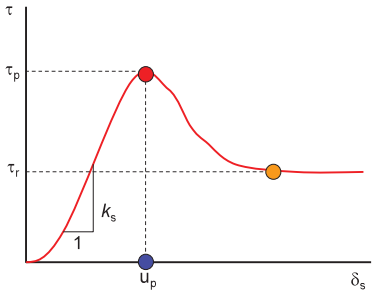
Shear deformation

A rough discontinuity also exhibits nonlinear shear deformation under shear loading, and shear dislocation can induce dilation in the normal direction:





τ_p: peak shear strength
τ_r: residual shear strength
u_p: shear displacement at peak
k_s: shear stiffness

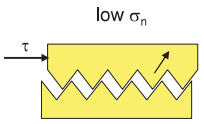
(Barton 2013)

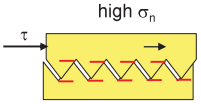
Shear strength

Strength along a discontinuity surface is mostly provided by asperities.

For shear failure to occur, discontinuity must either dilate, allowing asperities to override one another, or shear through the asperities.

As normal stresses increase, dilatancy is gradually reduced as a greater proportion of the asperities are damaged during shearing.





Considerable increases in shear strength accompany shearing with restricted dilatancy → explain why limiting dilation on discontinuities by rock bolting can stabilize excavations in discontinuous rock.