Mohr's Circle

Mohr's Circle is a graphic interpretation of the stress transformation equations:

$$s_n - \frac{s_x + s_y}{2} = \frac{s_x - s_y}{2}\cos(2q) + t_{xy}\sin(2q)$$

$$t_{nt} = -\frac{s_x - s_y}{2}\sin(2q) + t_{xy}\cos(2q)$$

It can be shown that a circle can be formed in terms of σ_n and τ_{nt}

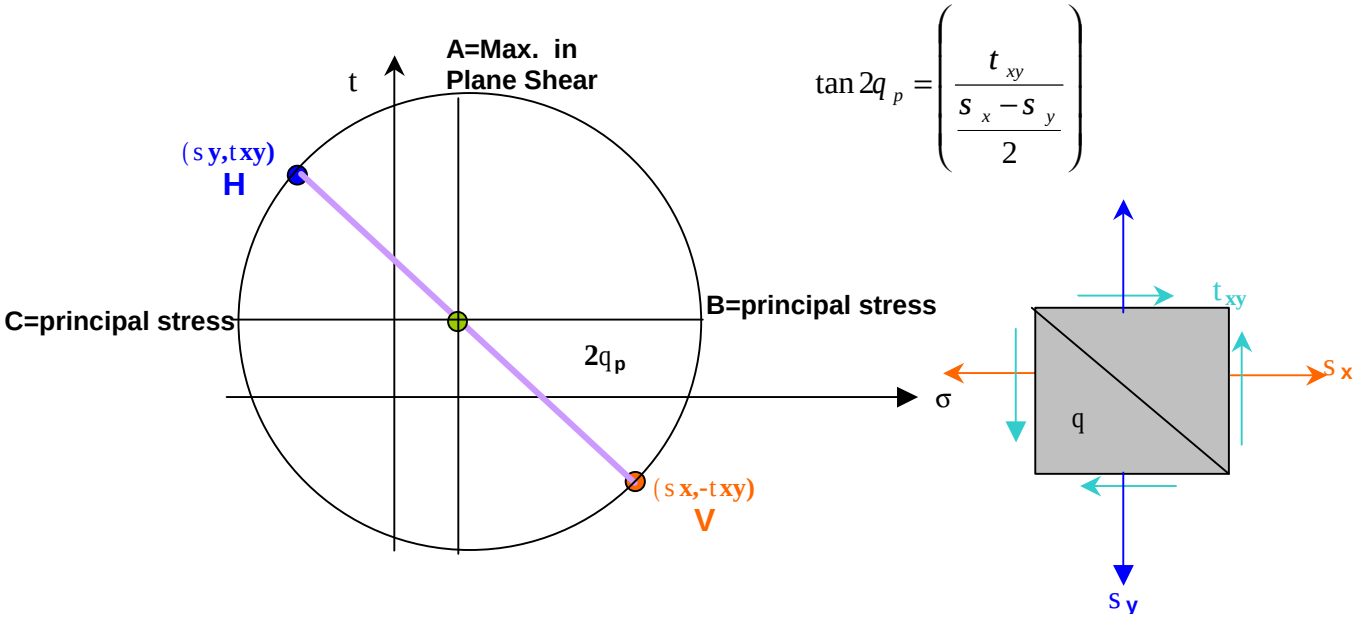
The radius of the circle is:

$$r = \sqrt{\left(\frac{q_x - q_y}{2}\right)^2 + t^2{}_{xy}}$$

Normal stresses are plotted on a horizontal axis; positive stress plotted to the right, and negative stresses to the left. **Shearing stresses** are plotted on the vertical axis.

Steps in creating a Mohr's Circle

1. Choose a set of x-y axis
2. Identify stresses σx, σy and τxy with proper signs.
3. Plot (σx, -τxy) and label this point V
4. Plot (σy, τxy) and label this point H
5. Draw a line connecting V and H; this establishes the center of the circle, C
6. Draw the circle
7. Label pertinent points, principal stresses, orientation in plane



$$\tan 2q_p = \left(\frac{t_{xy}}{\frac{s_x - s_y}{2}}\right)$$

Example:

Plot the Mohr's circle that represents the stress element shown