Criterio da Máxima tensão Normal

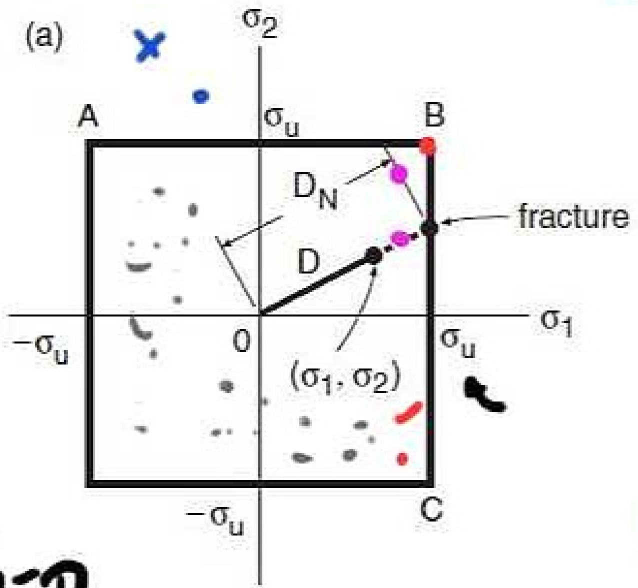
$\bar{\sigma}_{ef} = \text{máx}(\sigma_1, \sigma_2, \sigma_3)$

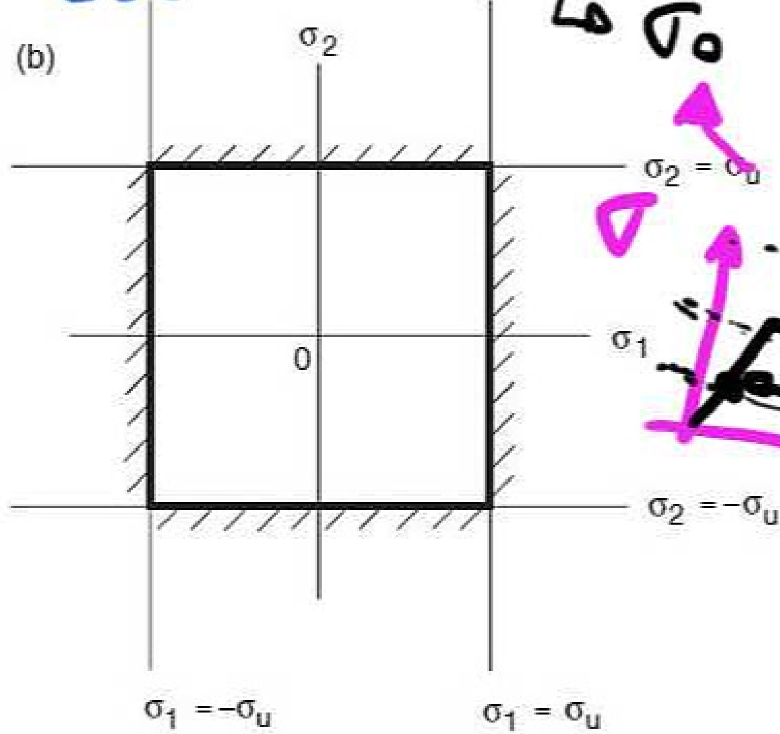
CARREGAMENTOS → $\bar{\sigma}_{ef} = \sigma_c$ → Resistência do Material

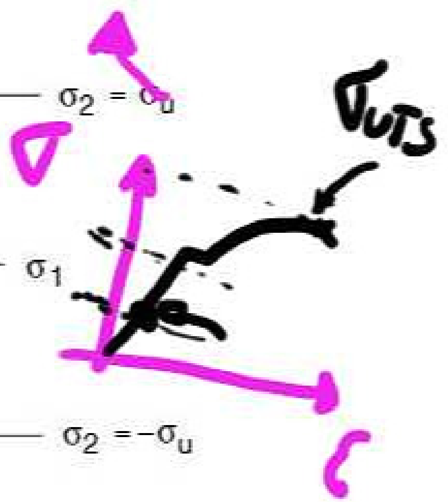
↳ σ_0

PLANO

$\sigma_3 = 0$







FALHA (YIELDING)

↳ MATERIAIS FRATURA FRÁGIL

- TRIAXIALIDADE DE TENSÕES
- TEMPERATURA
- TAXAS DE CARREGAMENTOS

Critério de Tresca

$\bar{\sigma}_{ef}$

$$\tau_o = \mathrm{MAX}\left(\frac{|\sigma_1 - \sigma_2|}{2}, \frac{|\sigma_2 - \sigma_3|}{2}, \frac{|\sigma_3 - \sigma_1|}{2}\right) \quad \text{(at yielding)}$$

VALOR CRÍTICO

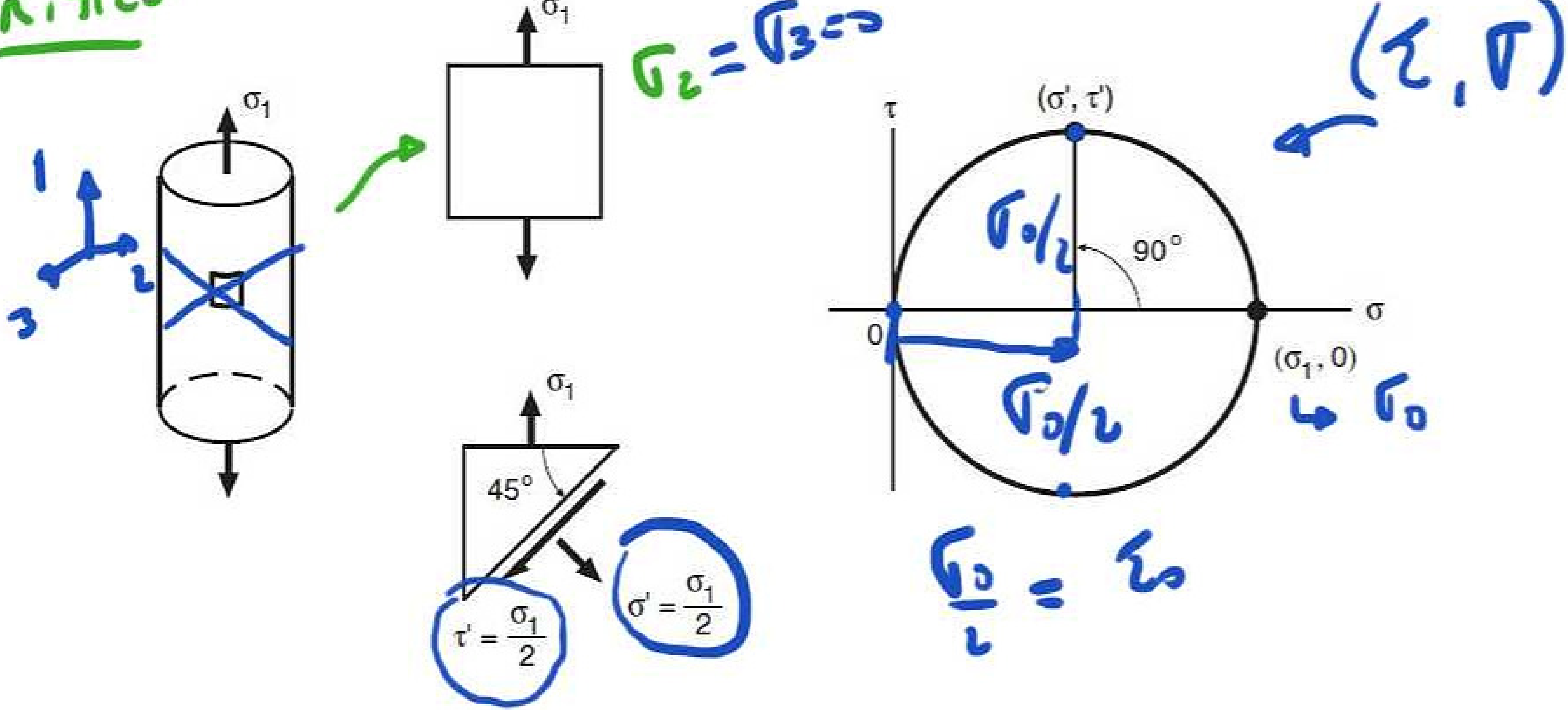


Figure 7.4 The plane of maximum shear in a uniaxial tension test.

τ_o $$\sigma_o = \mathrm{MAX}(|\sigma_1 - \sigma_2|\,, |\sigma_2|\,, |\sigma_1|)$$, $\sigma_3 = 0$

The region of no yielding, where $\bar{\sigma}_S < \sigma_o$, is thus the region bounded by the lines

$$\sigma_1 - \sigma_2 = \pm\sigma_o, \qquad \sigma_2 = \pm\sigma_o, \qquad \sigma_1 = \pm\sigma_o$$

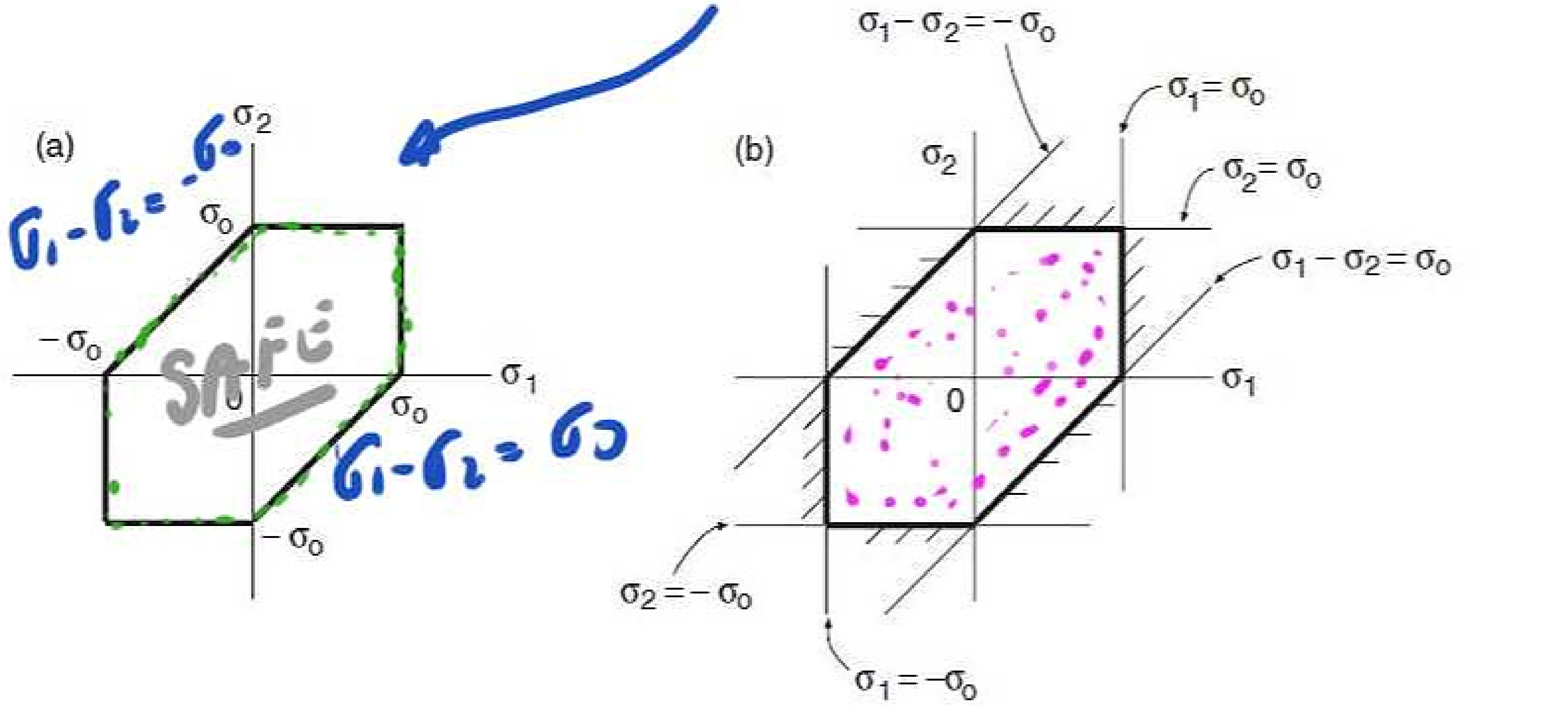


Figure 7.5 Failure locus for the maximum shear stress yield criterion for plane stress.

$3D \quad \sigma_1 \quad \sigma_2 \quad \sigma_3 \quad \neq 0$

$\cancel{\sigma_1 - \sigma_2} = \pm \sigma_0 \qquad \sigma_2 - \sigma_3 = \pm \sigma_0 \qquad \sigma_3 - \sigma_1 = \pm \sigma_0$

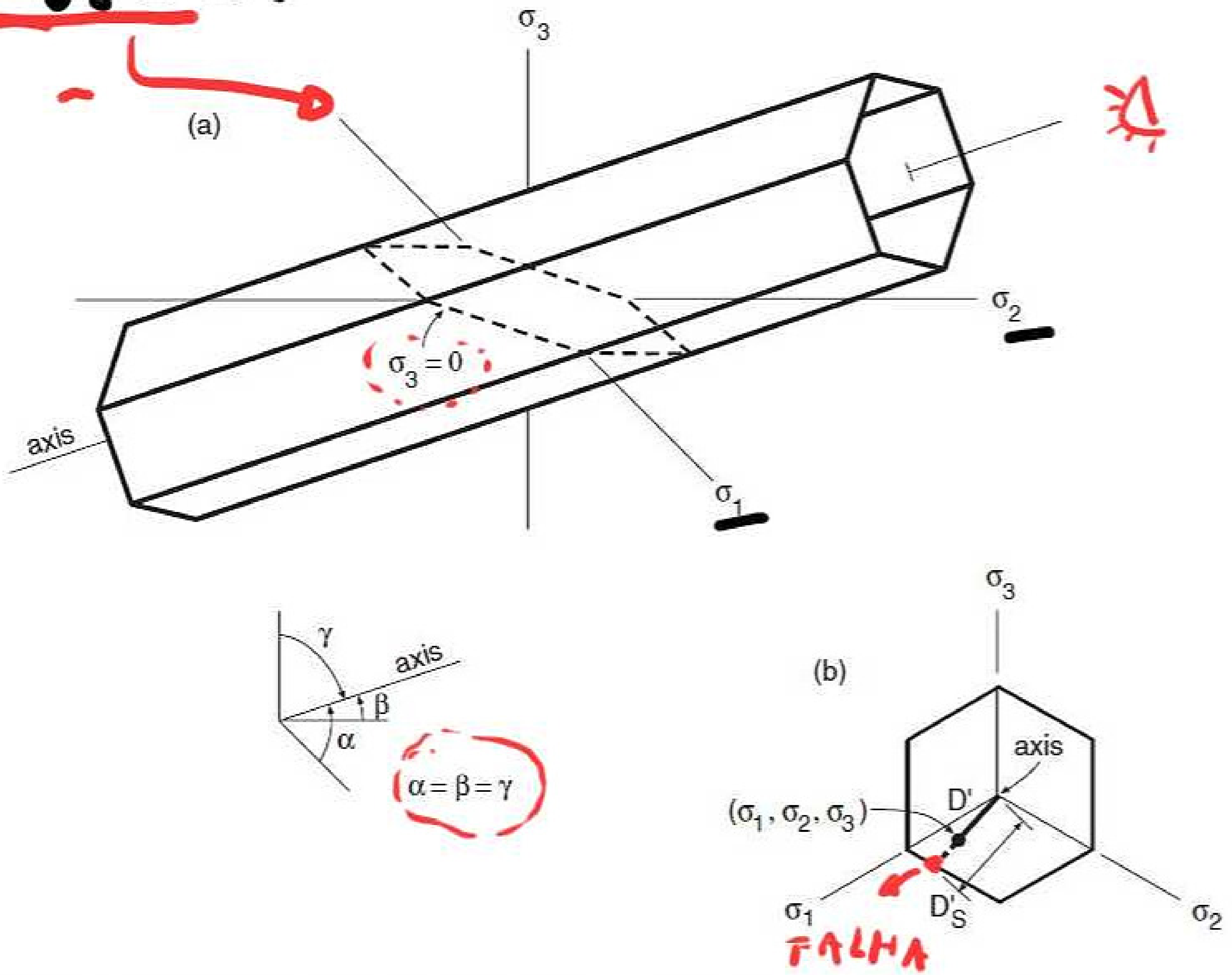


Figure 7.6 Three-dimensional failure surface for the maximum shear stress yield criterion.

Hydrostatic Stresses and the Maximum Shear Stress Criterion

NÃO ESCOAMENTO

$$\sigma_1 = \sigma_2 = \sigma_3 = \sigma_h$$

$F.S = \dfrac{\tau_0}{\bar{\sigma}_{ef}}$ (ESCOAMENTO

$\bar{\sigma}_{ef} = -$

$\bar{\sigma}_{ef} = \text{máx}\left(\sigma_1 - \sigma_2 \,;\, \sigma_2 - \sigma_3 \,;\, \sigma_3 - \sigma_1\right)$

• CRITÉRIO DO von Mises (Tensão Cisalhan. OCTAÉDRICA)

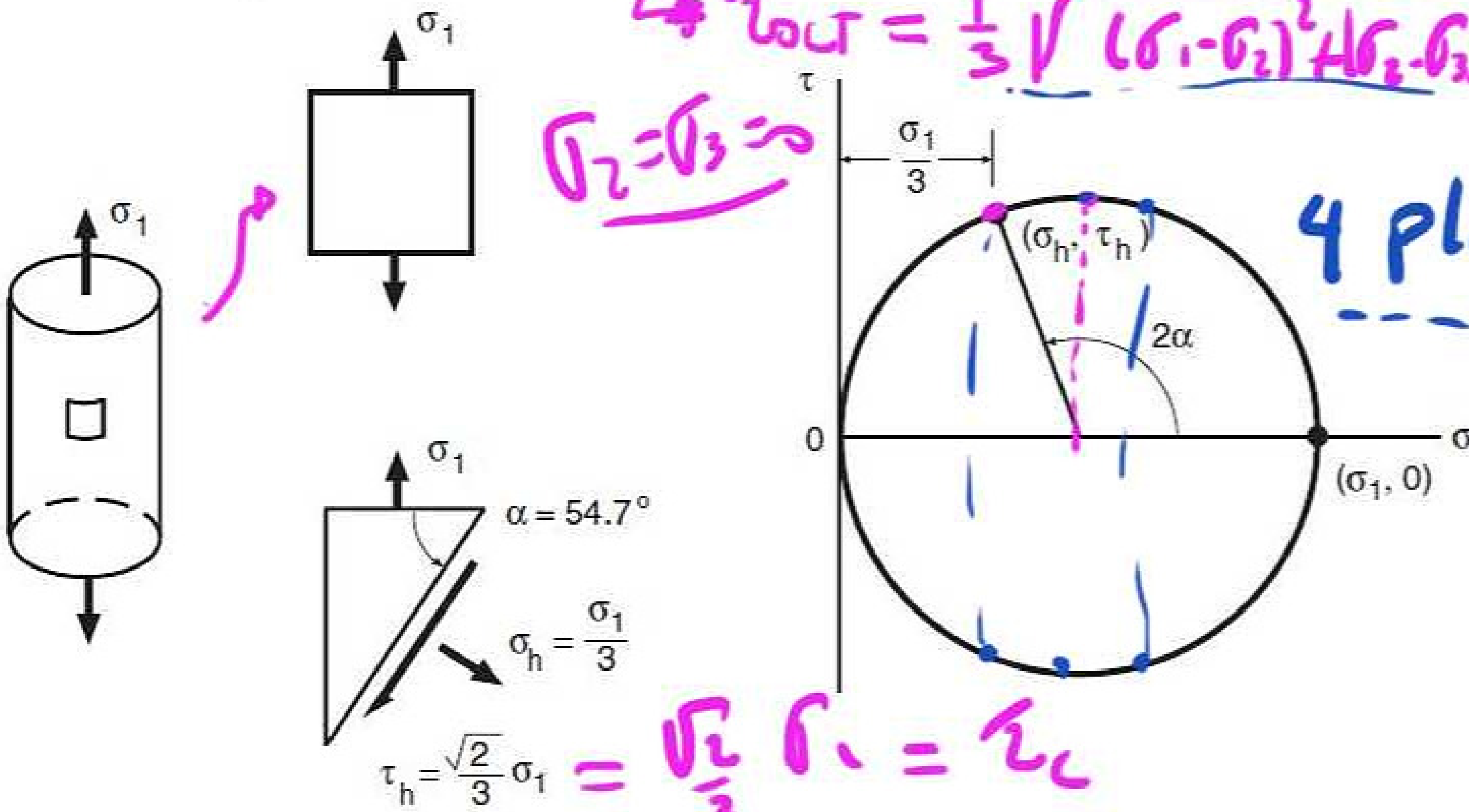
$$\sigma_o = \frac{1}{\sqrt{2}}\sqrt{(\sigma_1-\sigma_2)^2+(\sigma_2-\sigma_3)^2+(\sigma_3-\sigma_1)^2} \qquad \text{(at yielding)}$$

$$\tau_c = \tau_{oct} \simeq \sqrt{\tau_1^2+\tau_2^2+\tau_3^2}$$

$$\tau_{oct} = \frac{1}{3}\sqrt{(\sigma_1-\sigma_2)^2+(\sigma_2-\sigma_3)^2+(\sigma_3-\sigma_1)^2}$$

$\sigma_2=\sigma_3=0$

4 planos



$= \frac{\sqrt{2}}{3}\sigma_1 = \tau_c$

Figure 7.7 The plane of octahedral shear in a uniaxial tension test.

Von Mises

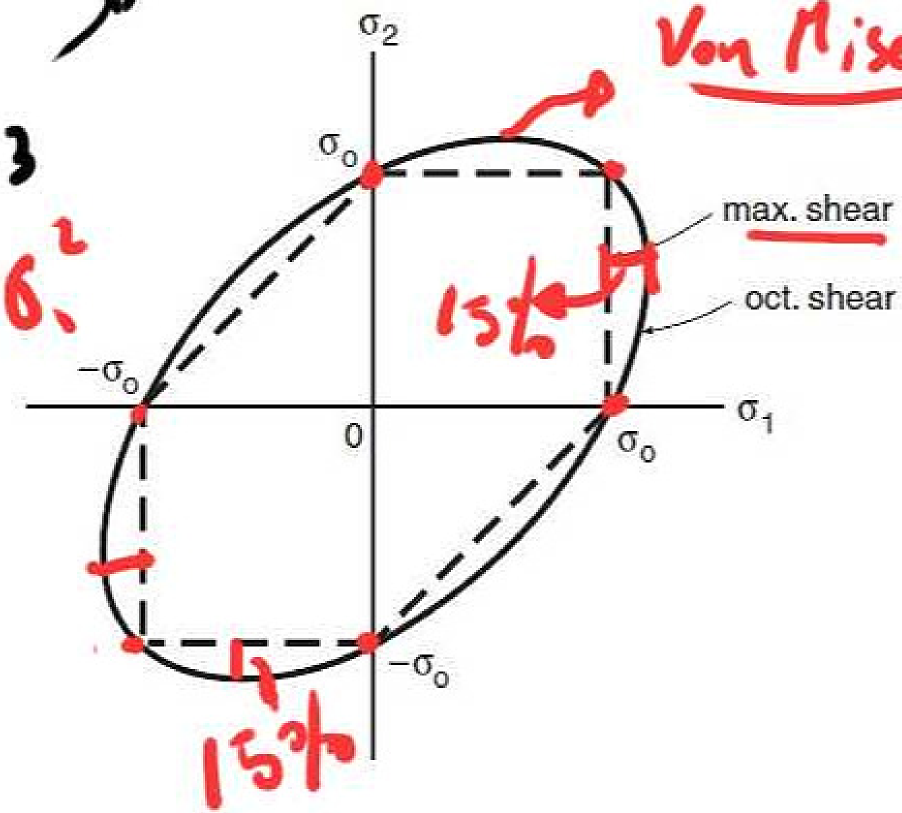
$$\sigma_o = \boxed{\frac{1}{\sqrt{2}}\sqrt{(\sigma_1-\sigma_2)^2+(\sigma_2-\cancel{\sigma_3})^2+(\cancel{\sigma_3}-\sigma_1)^2}} \quad \text{(at yielding)}$$

$$\bar{\sigma}_H = \boxed{\frac{1}{\sqrt{2}}\sqrt{(\sigma_x-\sigma_y)^2+(\sigma_y-\sigma_z)^2+(\sigma_z-\sigma_x)^2+6(\tau_{xy}^2+\tau_{yz}^2+\tau_{zx}^2)}}$$

$\hookrightarrow \bar{\sigma}_{ef}$

$\sigma_{ij} = \left[\quad\right]_{3\times 3}$

Von Mises



2D

$\sigma_3 = 0$

$$\sigma_o^2 = \underbrace{(\sigma_1-\sigma_2)^2}_{\sigma_1\sigma_2} + \sigma_2^2 + \sigma_1^2$$

$$\sigma_0 = \frac{1}{\sqrt{2}}\left[(\sigma_1-\sigma_2)^2+(\sigma_2-\sigma_3)^2+(\sigma_3-\sigma_1)^2\right]^{1/2}$$

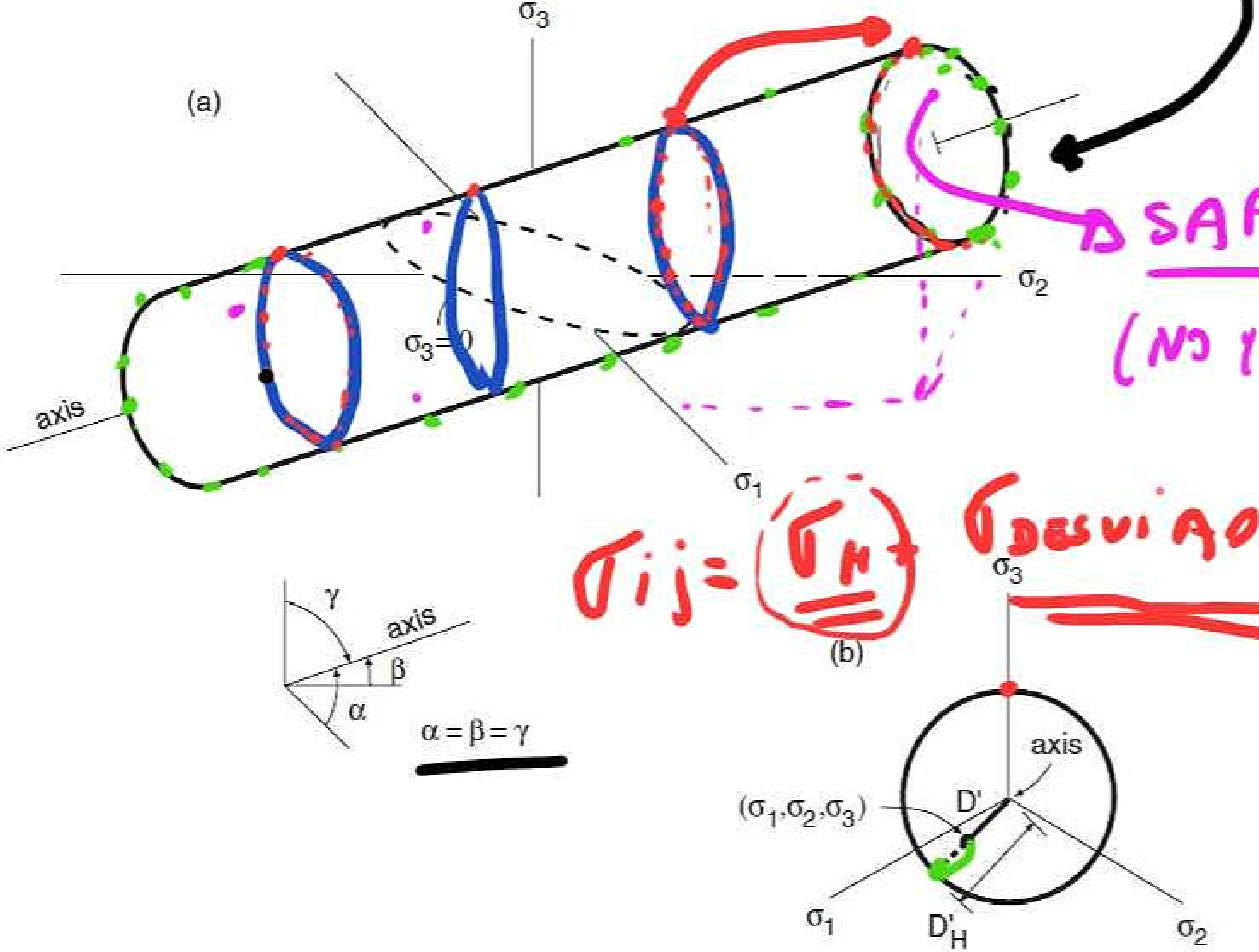
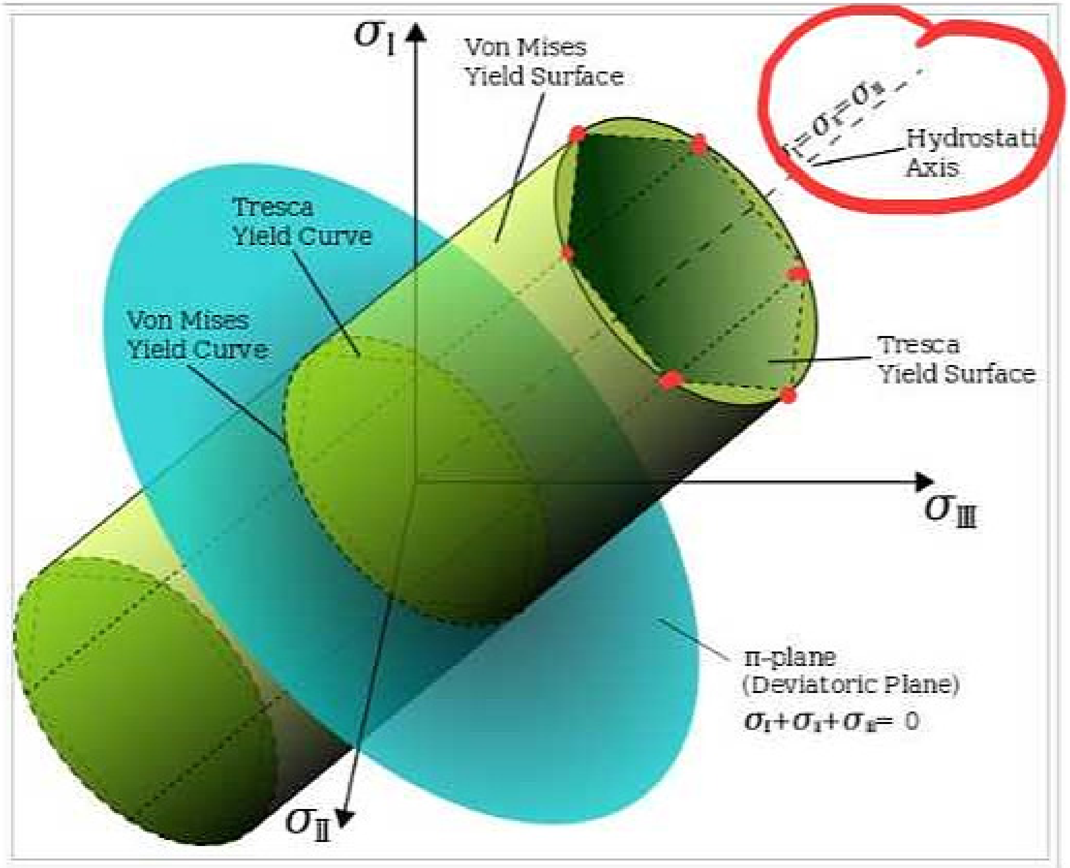


Figure 7.9 Three-dimensional failure surface for the octahedral shear stress yield criterion.


σ_{I}
Von Mises
Yield Surface
Hydrostati
Axis
Tresca
Yield Curve
Von Mises
Yield Curve
Tresca
Yield Surface
σ_{III}
π-plane
(Deviatoric Plane)
σ_{II}

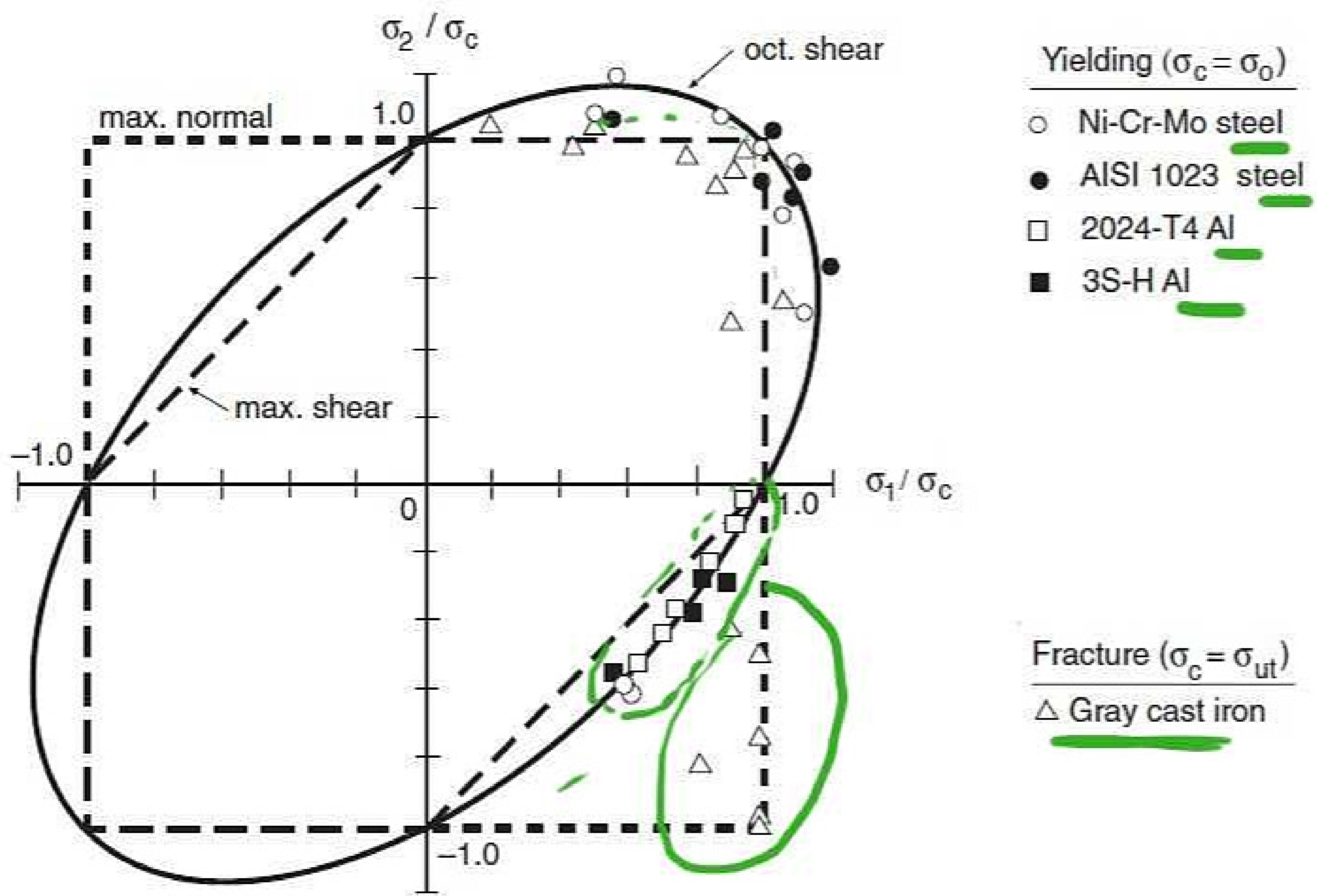
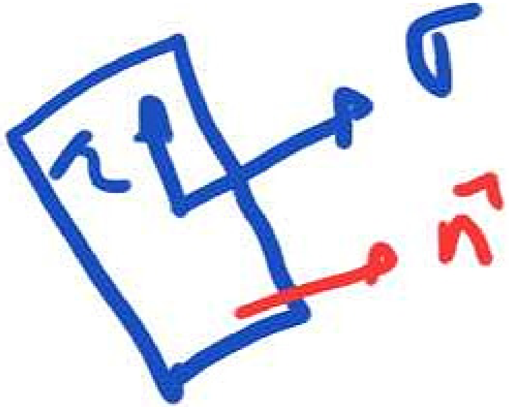
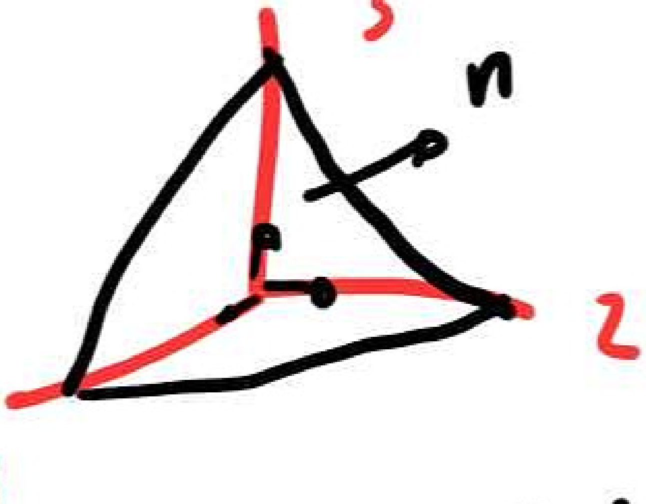


Figure 7.11 Plane stress failure loci for three criteria. These are compared with biaxial yield data for ductile steels and aluminum alloys, and also with biaxial fracture data for gray cast iron. (The steel data are from [Lessells 40] and [Davis 45], the aluminum data from [Naghdi 58] and [Marin 40], and the cast iron data from [Coffin 50] and [Grassi 49].)

PLANO OCTAÉDRICO $\qquad \alpha = \beta = \gamma$



$$\vec{n} = \left(1/\sqrt{3},\ 1/\sqrt{3},\ 1/\sqrt{3}\right)$$



$$\tau_{OCT} = \frac{1}{3}\sqrt{(\ )^2 + (\ )^2 + (\ )^2}$$

$$|\sigma| = \vec{t} \cdot \vec{n}$$

$$\vec{t} = \sigma_{ij} \cdot n$$

$$\sigma_{ij} = \begin{bmatrix} \sigma_1 & 0 & 0 \\ 0 & \sigma_2 & 0 \\ 0 & 0 & \sigma_3 \end{bmatrix}$$

$$|\vec{t}|^2 = |\sigma|^2 + |\tau|^2$$

$$|\tau|^2 = |\vec{t}|^2 - |\sigma|^2$$