9. The bond strength of reinforcing bars

- ACI 318 – 89 → complicated
- ACI 318 – 95 → sinplified

Development length

$$U_{ld} = T_y$$

$$U = u \cdot \pi \cdot d_b$$

$$l_d = \frac{T_y}{U} = \frac{A_s f_y}{u \cdot \pi \cdot d_b} = \frac{\frac{\pi}{4} d_b{}^2 f_y}{u \cdot \pi \cdot d_b} = \frac{d_b f_y}{4u}$$

$$u = \alpha \sqrt{f_c'}$$

$$\therefore l_d = \frac{\alpha}{\sqrt{f_c'}} d_b f_y$$

& a depends on confinement K

- Local failure mechanism ①

$$W_E = P u_{cs} \cos\alpha$$

$$D = \frac{l}{a}\frac{e}{\sin\gamma}\cdot 2\left(\frac{d}{2}+\frac{e}{2}\right)\pi\left[\frac{1}{2}f_c\left(1-\sin(\alpha-\gamma)\right)+f_t\frac{\sin(\alpha-\gamma)-\sin\varphi}{1-\sin\varphi}\right]$$

- Local failure mechanism ②