$$F_c = \frac{\tau_s \cdot A \cdot \cos(\beta-\alpha)}{\sin\phi \cdot \cos(\phi+\beta-\alpha)\cdot[1-k\cdot\tan(\phi+\beta-\alpha)]}$$

$$= \frac{\tau_s \cdot A \cdot \cos(\beta-\alpha)}{\sin\phi\cdot\cos(\phi+\beta-\alpha) - k\sin\phi\cdot\cancel{\cos(\phi+\beta-\alpha)}\cdot\frac{\sin(\phi+\beta-\alpha)}{\cancel{\cos(\phi+\beta-\alpha)}}}$$

* $\sin x \cdot \cos y = \frac{1}{2}\{\sin(x+y)+\sin(x-y)\}$

$\sin x \cdot \sin y = \frac{1}{2}\{\cos(x-y)-\cos(x+y)\}$

의 관계에서

$$F_c = \frac{\{2\tau_{s0}\cdot A\cdot\cos(\beta-\alpha)\}}{\{\sin(2\phi+\beta-\alpha)-\sin(\beta-\alpha)-k\cdot\cos(\beta-\alpha)+k\cdot\cos(2\phi+\beta-\alpha)\}}$$

$$\therefore \frac{dF_c}{d\phi} = \frac{0-\{2\cdot\cos(2\phi+\beta-\alpha)-2\cdot k\cdot\sin(2\phi+\beta-\alpha)\}\{\ \}}{\{\ \}^2} = 0$$

$$\therefore \cos(2\phi+\beta-\alpha) = k\cdot\sin(2\phi+\beta-\alpha)$$

$$\therefore \cot(2\phi+\beta-\alpha) = k$$

$$\therefore 2\phi+\beta-\alpha = \cot^{-1}k$$

$\cot^{-1}k = C$ 라 하면

$$2\phi+\beta-\alpha = C \qquad (2\text{-}31)$$