~~Mod~~ CAM CLAY MODEL - FORMULATION

1 Assume : The work dissipated during loading by unit volume is given by:

$$dW^p = p d\varepsilon_v^p + q d\varepsilon_d^p = Mp d\varepsilon_d^p \quad (1)$$

2 Assume: The direction of plastic strain increment vector is normal to the yield function

$$d\varepsilon_v^p = \Lambda \frac{\partial f}{\partial p} ; \quad d\varepsilon_d^p = \Lambda \frac{\partial f}{\partial q} \quad (2)$$

(2)→(1): $$p \frac{\partial f}{\partial p} + q \frac{\partial f}{\partial q} = Mp \frac{\partial f}{\partial q} \quad (3)$$

3 Consistency condition: stres point cannot be outside the yield locus:

$$df = 0$$

$$\Leftrightarrow \frac{\partial f}{\partial p} dp + \frac{\partial f}{\partial q} dq = 0 \quad (4)$$

(3)&(4) $\Rightarrow$ $$\frac{\partial q}{\partial p} = \frac{q}{p} - M$$

$$\Rightarrow \int \frac{\partial q}{\partial p} = \int \left(\frac{q}{p} - M\right) dp$$

$$\Rightarrow q = Mp(\ln p + C)$$

When $q/p = 0$; $p = p_c$

$\Rightarrow$ Cam-clay yield locus :

$$q = Mp \ln \frac{p_c}{p}$$

or: $$f = q + Mp \ln \frac{p}{p_c}$$

MCC.

$p\dot{\varepsilon}_v^p + q\dot{\varepsilon}_d^p = p\sqrt{(\dot{\varepsilon}_v^p)^2 + (M\dot{\varepsilon}_d^p)^2}$

MCC

$f = \frac{q}{M^2 p} + (p_c - p)p$