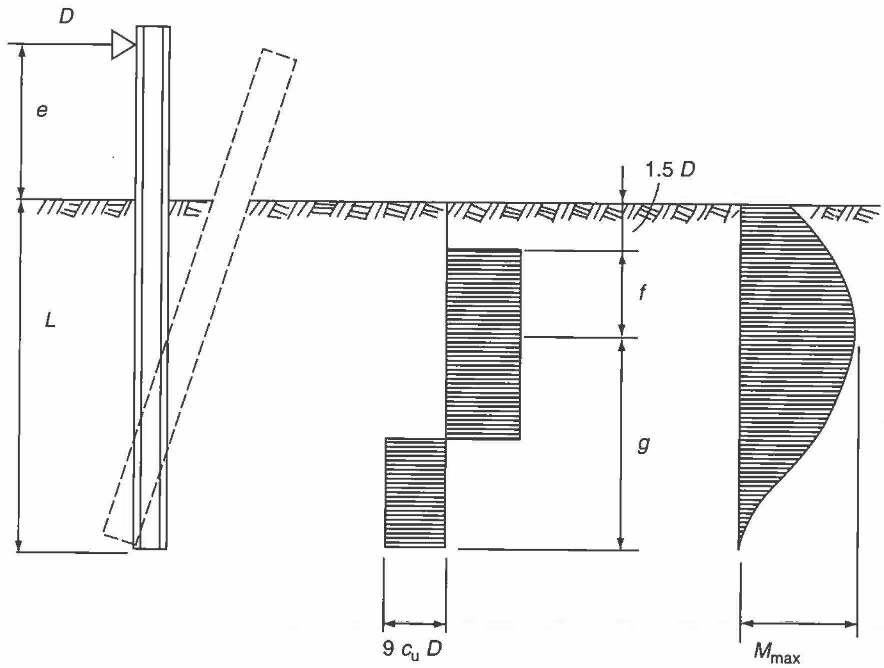


FIGURE 8.2
Deflection, soil reaction, and bending moment distributions for laterally loaded short piles in cohesive soil. (From Broms, B., 1964a, *J. Soil Mech. Found. Div., ASCE*, 90(SM3):27–56. With permission.)

Since the shear force is zero at the location of maximum moment, from the area of the soil reaction plot (Figure 8.2) one obtains

$$f = \frac{P_u}{9c_u D} \tag{8.1}$$

Similarly, by taking the first moments of Figure 8.2 about the yield point

$$M_{max} = 2.25Dg^2c_u \tag{8.2}$$

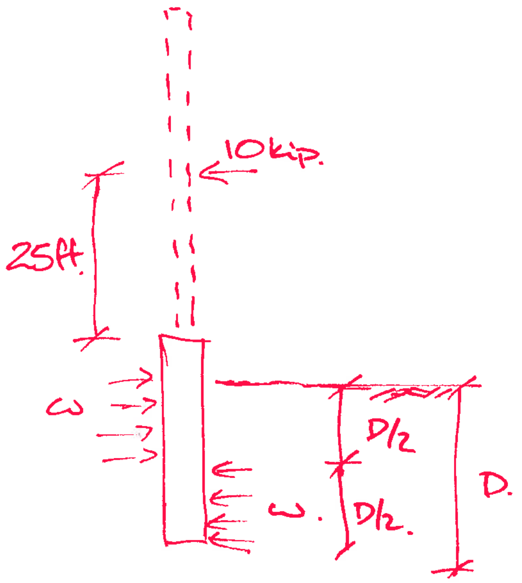
$$M_{max} = H_u(e + 1.5D + 0.5f) \tag{8.3}$$

For the total length of the pile,

$$L = g + 1.5D + f \tag{8.4}$$

8.2.1.1.2 *Restrained or Fixed-Head Piles*

According to the Broms (1964a) formulations, restrained piles can reach their ultimate capacity through three separate mechanisms giving rise to (1) short piles, (2) long piles, and (3) intermediate piles. These failure mechanisms assumed by Broms (1964a) for restrained piles are illustrated in Figure 8.5(a)–(c). The assumption that leads to the analytical solutions is that the moment generated on the pile top can be provided by the pile cap to restrain the pile with the boundary condition at the top (i.e., no rotation).



$V^* = 10\text{kips}.$

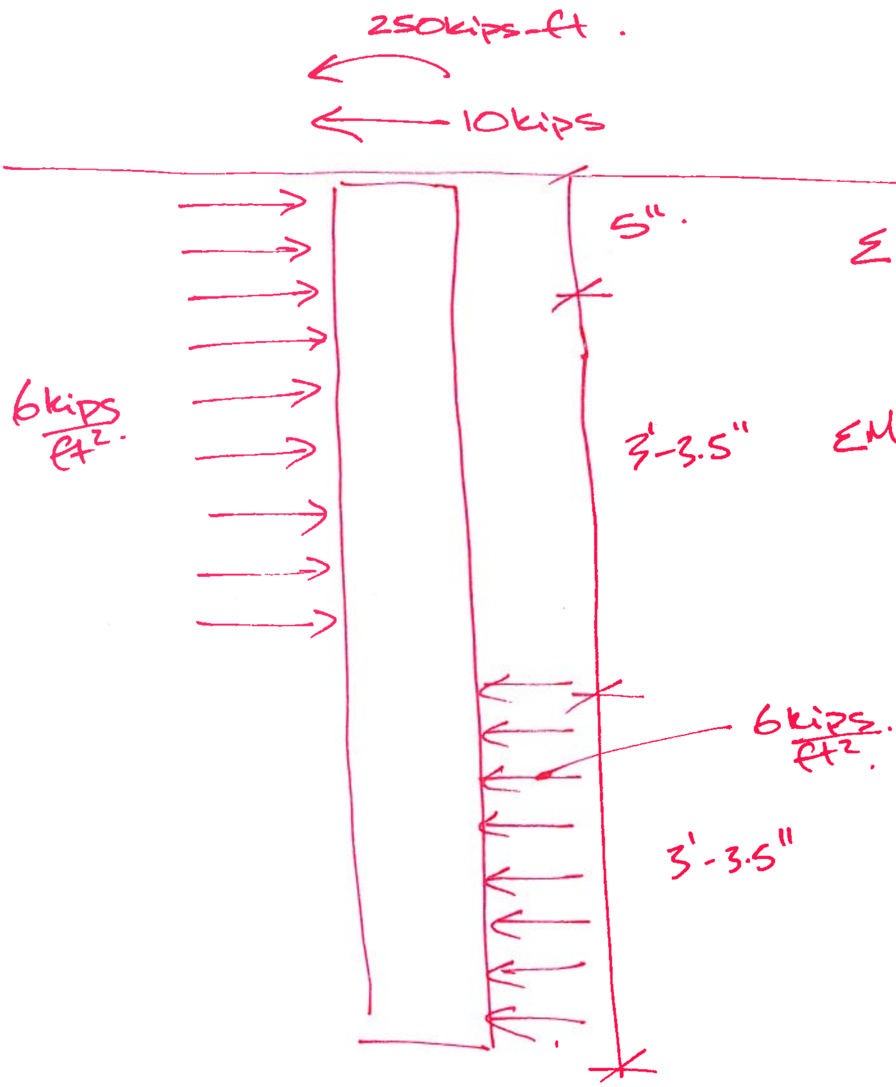
$M^* = 250\text{kips-ft}$

$M_{RESTORING} = \left(\omega \cdot b \cdot \frac{D}{2}\right) \cdot \left(\frac{D}{2}\right).$

Passive Soil = $6\text{kips/ft}^2.$

Depth of Soil for Shear = $\frac{5}{12}\text{ft}.$

Pile Dia = 4ft.



$$\Sigma V = 10\text{kips} - 6\frac{\text{kips}}{\text{ft}} \times 4\text{ft} \times \frac{5}{12}\text{ft} = 0$$

$$\Sigma M = 250\text{kips-ft} + 6\frac{\text{kips}}{\text{ft}^2} \times 4\text{ft} \times \frac{44.5\text{ft}}{12} \times \frac{22.25}{12}\text{ft} - 6\frac{\text{kips}}{\text{ft}^2} \times 4\text{ft} \times \frac{39.5}{12}\text{ft} \times \frac{64.25}{12}\text{ft} \approx 0.$$