SAMPLE PROBLEM

Point in question: S = 12 ft H = 6 ft

$q = \frac{80{,}000 \text{ lbs}}{(5 \text{ ft})(9 \text{ ft})} = 1778 \text{ psf}$ for E80 loading, axle spacing = 5 ft, tie length b = 9 ft

Solve for $X_1 = S - b/2 = 7.5$ ft

Solve for $X_2 = S + b/2 = 16.5$ ft

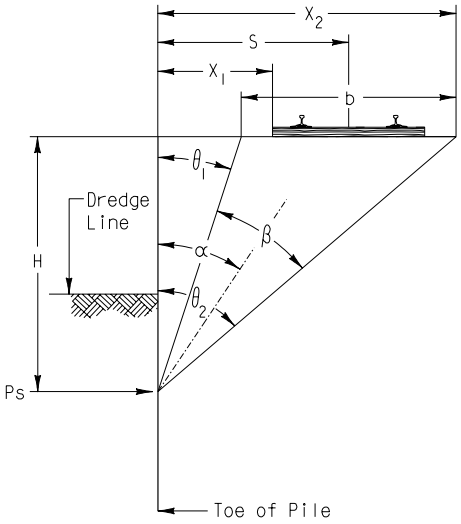
Solve for $\theta_1 = \arctan\left(\frac{X_1}{H}\right) = 0.896$ radians

Solve for $\theta_2 = \arctan\left(\frac{X2}{H}\right) = 1.222$ radians

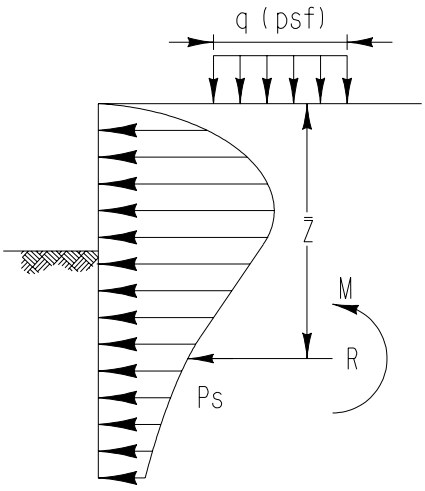
Solve for $\beta = \theta_2 - \theta_1 = 0.326$ radians

Solve for $\alpha = \frac{\theta_1 + \theta_2}{2} = 1.059$ radians

Note: $\tan\alpha \neq \frac{S}{H}$



PRESSURE DISTRIBUTION FOR STRIP LOAD



EQUIVALENT LOADING

- Pressure, Ps due to E80 liveload at the above-identified point:

$$Ps = \frac{2q}{\pi}(\beta - \sin\beta\cos 2\alpha) = \frac{2*1778}{\pi}(0.326 - \sin(0.326)\cos(2*1.059)) = 558.\text{psf}$$

- Shear due to E80 liveload at the above-identified point:

$$R_x = \frac{2qH\beta}{\pi} = \frac{2*1778*6*0.326}{\pi} = 2214.lbs \text{ /ft}$$

- Depth $\bar{z}$ from base of tie:

$$\bar{z} = \frac{H^2\beta - bH + x_2^2\left(\frac{\pi}{2} - \theta_2\right) - x_1^2\left(\frac{\pi}{2} - \theta_1\right)}{2H\beta} = \frac{6^2*0.326 - 9*6 + 16.5^2\left(\frac{\pi}{2} - 1.222\right) - 7.5^2\left(\frac{\pi}{2} - 0.896\right)}{2*6*0.326} = 3.77\text{ft}$$

- Moment due to E80 liveload at the above identified point:

$$M = R_x\left(H - \bar{z}\right) = 2214 * \left(6 - 3.77\right) = 4940 \text{ ft-lbs/ft}$$

Use the above equations to determine Ps, M, R_x & $\bar{z}$ due to the E80 liveload along the **entire** depth of the shoring system. Typically the equations are evaluated on 6" increments to determine the maximum values along the depth of the shoring system. The resultants must be combined with other applicable pressures and loads to evaluate the total loading on the shoring system for the entire depth of the system. Determine the minimum embedment depth required and the minimum cross sectional properties of the shoring system based on the allowable stresses and the required factors of safety.