Chapter 14

14.1 $P_p = \frac{1}{2}K_p\gamma H^2$; $K_p = K_{p(\delta'=0)}R$. With $\phi' = 35°$, $\theta = 10°$, and $\alpha = 0$, the value of $K_{p(\delta'=0)} = 2.97$ (Table 14.1). With $\theta = 10°$, $\delta' = 21°$, $\delta'/\phi' = 21/35 = 0.6$, the value of R is 1.85 (Table 14.2). So,

$$P_p = \frac{1}{2}(2.97 \times 1.85)(15.5)(6)^2 \approx \mathbf{1533\ kN/m}$$

14.2 $P_p = \frac{1}{2}K_p\gamma H^2$. From Figure 14.5, for $\phi' = 30°$ and $\delta' = 20°$, $\delta'/\phi' = 2/3$, the value of K_p is about 4.2. So,

$$P_p = \frac{1}{2}(4.2)(100)(15)^2 = \mathbf{47{,}250\ lb/ft}$$

14.3 From Table 14.1, for $\phi' = 30°$ and $\theta = 0$, the value of $K_{p(\delta'=0)} = 3.0$. For $\theta = 0$ and $\delta'/\phi' = 2/3$, the value of R is 1.75. So

$$P_p = \frac{1}{2}(3 \times 1.75)(100)(15)^2 \approx \mathbf{59{,}063\ lb/ft}$$

14.4 $P_p = \frac{1}{2}\gamma H^2 K_p$. For $\phi' = 30°$ and $\delta' = 20°$, the value of K_p is about 5.47 (Figure 14.4).

$$P_p = \frac{1}{2}(14.8)(2.5)^2(5.47) \approx \mathbf{253\ kN/m}$$

14.5 Eq. (14.13): $P_{pe} = \left[\frac{1}{2}\gamma H^2 K_{p\gamma(e)}\right]\frac{1}{\cos\delta'}$

For $k_v = 0$, $k_h = 0.3$, $\delta'/\phi' = 15/30 = 0.5$, the value of $K_{p\gamma(e)} = 3.43$.

$$P_{pe} = \left[(0.5)(16)(5)^2(3.43)\right]\frac{1}{\cos 15} = \mathbf{710.2\ kN/m}$$

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14.6 $n_a = \dfrac{2\text{ m}}{5\text{ m}} = 0.4$. $\phi' = 35°$; $\delta' = 20°$. Table 14.3: $\dfrac{P_a}{0.5\gamma H^2} = 0.248$

$P_a = (0.248)(0.5)(16)(5)^2 =$ **49.6 kN/m**

14.7 $n_a = \dfrac{4.68\text{ m}}{15.6\text{ m}} = 0.3$; $\dfrac{c'}{\gamma H} = \dfrac{28}{(18)(15.6)} = 0.1$

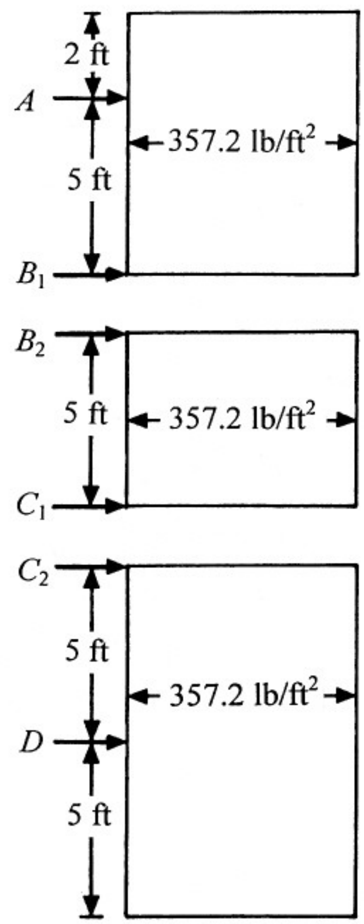
From Table 14.4 for $\phi' = 20°$ and $\delta' = 15°$, $\dfrac{P_a}{0.5\gamma H^2} = 0.122$.

$P_a = (0.122)(0.5)(18)(15.6)^2 \approx$ **267.2 kN/m**

14.8 $P_s = 0.65\gamma H \tan^2\left(45 - \dfrac{\phi'}{2}\right)$

$= (0.65)(105)(22)\tan^2\left(46 - \dfrac{38}{2}\right)$

$= \mathbf{357.2\ lb/ft^2}$



$\sum M_{B_1} = 0$

$A = \left(\dfrac{1}{5}\right)\left[(357.2)(7)\left(\dfrac{7}{2}\right)\right] = 1750.3\text{ lb/ft}$

$B_1 = (357.2)(7) - 1750.3 = 750.1$ lb/ft

$B_2 = C_1 = \dfrac{(357.2)(5)}{2} = 893\text{ lb/ft}$

$\sum M_{C_2} = 0$

$D = \left(\dfrac{1}{5}\right)\left[(357.2)(10)\left(\dfrac{10}{2}\right)\right] = 3572\text{ lb/ft}$

$C_2 = (357.2)(10) - 3572 = 0$ lb/ft

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Strut Loads:

$A = (1750.3)(8) \approx$ **14,002 lb**

$B = (B_1 + B_2)(8)$

$= (750.1 + 893)(8) \approx$ **13,145 lb**

$C = (C_1 + C_2)(8)$

$= (893 + 0)(8) =$ **7144 lb**

$D = (3752)(8) =$ **28,576 lb**

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